Emergent Strength Strata in Cherokee Hiatus Resolution

Overview. Cherokee (Southern Iroquoian; North Carolina, Oklahoma) exhibits a complex and highly idiosyncratic pattern of hiatus resolution among verb roots and prefixes. When morpheme concatenation places two vowels in adjacent positions, hiatus is always repaired, either by glide insertion (/V_1 V_2/ → [V_1 j V_2]), or by deletion of one or the other vowel in a pair of adjacent vowels (/V_1 V_2/ → [V_1] or /V_1 V_2/ → [V_2]). Importantly, it is the identity of each of the morphemes these vowels belong to that determines which repair strategy occurs. Previously proposed predictors of the outcome of hiatus resolution such as directionality, morphological structure, vowel quality, or vowel quantity, cannot account for the highly idiosyncratic (i.e. lexically specific) nature of hiatus resolution in Cherokee.

We analyze this pattern using Gradient Harmonic Grammar (GHG; Smolensky and Goldrick 2016), a weighted constraint system in which individual elements of inputs are specified for non-integer degrees of activity (i.e. presence) between zero and one. This framework is especially suited to analyzing idiosyncratic phonological patterns as the result of contrasts in the activity levels associated with input elements.

Cherokee Morphophonology. In Cherokee, verbs may surface with a number of prefixes; we focus here on the interaction between obligatory pronominal prefixes (53 morphemes across six paradigms), optional voice prefixes (middle and reflexive), and verb roots (see Montgomery-Anderson 2008 for an overview). When concatenation of these roots and prefixes results in two vowels being adjacent in an input, it is always repaired in the output. Based on patterns in which morphemes' vowels undergo glide insertion versus deletion when adjacent to one another, we identify three strength strata among vowels in Cherokee roots and prefixes, which we refer to as Strong, Medium, and Weak.

The data in (1) illustrate a few of these interactions. Vowels in strong morphemes never delete in hiatus conditions. When they are adjacent to one another, no vowel is deleted; instead, a glide is inserted between them (1a). These Strong vowels also trigger deletion of other vowels, as in (1b,d). Medium vowels delete when adjacent to strong vowels (1b), but trigger deletion of adjacent weak vowels (1c). Weak vowels always delete in hiatus conditions (1c,d).

(1) Hiatus Resolution (all examples from Montgomery-Anderson 2008)

a. Set A (animate object) + Root
/ts͡i:- **a**taʔjiha/ → [ts͡i:**j****a**t …] (p. 157)
1A.AN deny.PRC

b. Set A (animate object) + Middle Voice
/ts͡i:- **a**li-/ → [ts͡i:l …] (p. 131)
1A.AN MDL

c. Set B + Middle Voice
/u:n**i**:- **a**li-/ → [u:n**a**l …] (p. 266)
3B.PL MDL-

d. Set B + Root
/o:gin**i**:- **a**du:liha/ → [o:gin**a**d…] (p. 322)
1B.DL.EX want

The strength designations of the vowels of different prefixes and roots are summarized in (2). In general, vowels within a morphological paradigm (a set of morphemes expressing the same type of morphological feature) pattern together strength-wise. The one observed exception is the Set B third person singular morpheme, whose vowels are stronger than those of other morphemes in the Set B paradigm and always surfaces in hiatus conditions. In addition, Object Focus pronominal prefixes can be classified as either Medium or Weak. Vowels in these prefixes are deleted when in hiatus with the Strong vowels of roots (/e:g**i**:-ə:niha/→[e:gə:niha] 'hit (2O.PL)'), but our data do not allow us to compare them with other Medium or Weak vowels.

(2) Morpheme/vowel strength designations

Strong: Set A (animate object), Set B (3.SG), Combined (local), Root
Medium: Middle, Reflexive
Weak: Set B (other than 3.SG), Set A, Combined (nonsingular subject)

Crucially, these strength designations do not align with previously proposed predictors of hiatus repair, such as directionality, morphological structure, vowel quality, or vowel quantity (Casali 1997, a.o.). Among the morphemes under focus here, pronominal prefixes occur first (leftmost) in a word and are further from the

root than voice prefixes, but can either be preserved (those designated Strong) or deleted (those designated Weak) in hiatus conditions. In addition, all of the six vowels in Cherokee's vowel inventory (i, e, a, o, u, ə), either long or short, are attested in Strong, Medium, and Weak morphemes. A successful analysis of hiatus resolution in Cherokee, then, must account for the lexically determined nature of the pattern.

GHG proposal. We analyze Cherokee hiatus resolution as the result of the interaction among the markedness constraint *VV (violated by vowels in hiatus) and the faithfulness constraints MAX and DEP. In GHG, the penalty of a MAX violation is proportional to the amount of segment activity deleted in the input-output mapping. Similarly, the penalty of a DEP violation is proportional to the amount of activity added in order for a segment to reach a full activity of 1 in the output. In our proposal, stronger segments are represented with higher levels of input activity than weaker ones; segments with higher input activity incur relatively high MAX penalties when deleted, and relatively low DEP violations for surfacing. The insertion of a glide incurs one full violation of DEP, as it is fully absent from the input representation.

This set of constraints and set of candidates (faithful surfacing of V_1+V_2 in hiatus, glide insertion, deletion of V_1, deletion of V_2) determine a threshold activity value above which vowels pattern as Strong. Preservation of both vowels and concomitant glide insertion are favored if both vowels are above an input activity threshold of $\frac{2 \times w(\text{DEP})}{w(\text{DEP})+w(\text{MAX})}$.

One set of constraint weights and activity values that meets these criteria and produces the pattern of hiatus resolution observed in Cherokee is shown in the following tableaux. In the tableau in (3), both vowels have an activity of 1, exceeding the activity threshold established above and patterning as Strong vowels. Candidate (b), where neither vowel is deleted and a glide is inserted, is chosen as optimal as it has a higher harmony than candidates that delete either of the vowels (c,d), or exhibit unrepaired vowel hiatus (a).

(3) Glide insertion between two Strong vowels

/$i_{1.0}$ - $a_{1.0}$/	*VV *w*=5	MAX *w*=4	DEP *w*=3	***H***
a. [i a]	−1			−5
☞ b. [i j a]			−1 (j)	−3
c. [i]		−1 (a)		−4
d. [a]		−1 (i)		−4

In contrast, if one or both vowels are below the input activity threshold for Strong vowels, the vowel with the higher activity will be preserved, while the other will delete. This is illustrated by the tableaux in (4) and (5). In (4), one vowel is Strong while the other is Medium (with an input activity of 0.67). Candidate (c), in which only the Strong vowel surfaces while the Medium vowel deletes, is chosen as optimal.

(4) Strong vowel surfaces, Medium vowel deletes

/$i_{1.0}$ - $a_{0.67}$/	*VV *w*=5	MAX *w*=4	DEP *w*=3	***H***
a. [i a]	−1		−0.33 (1−a)	−5.99
b. [i j a]			−1 (j) + −0.33 (1−a)	−3.99
☞ c. [i]		−0.67 (a)		−2.68
d. [a]		−1 (i)	−0.33 (1−a)	−4.99

(512) Medium vowel surfaces, Weak vowel deletes

/$i_{0.67}$ - $a_{0.33}$/	*VV *w*=5	MAX *w*=4	DEP *w*=3	***H***
a. [i a]	−1		−0.33 (1–i) −0.67 (1−a)	−8
b. [i j a]			−1 (j) + −0.33 (1–i) −0.67 (1−a)	−6
☞ c. [i]		−0.33 (a)	−0.33 (1–i)	−2.31
d. [a]		−0.67 (i)	−0.67 (1−a)	−4.69

In (5), one vowel is Medium while the other is Weak (with an input activity of 0.33). Candidate (c), in which the higher-activity Medium vowel surfaces, is chosen as optimal. Note that there is no threshold value that distinguishes Medium from Weak vowels. The arbitrary values of 1.0, 0.67, and 0.33 used in this analysis serve only to reflect the fact that we observe three distinct strata of strengths among interacting Cherokee prefixes.

References

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