An Agreement-by-Correspondence Analysis of Máihɨ̃ki Nasalization Harmony

The Tukanoan languages are famous for their nasal harmony systems in which, prototypically, morpheme-associated nasalization spreads across all vowels and consonants within a word, leaving only certain consonants unaffected. A language with such a harmony system is Barasano (Southern dialect), in which nasalization spreads throughout a nasal root morpheme and on to alternating affixes, leaving only voiceless obstruents unaffected (Walker 2000b:144). This system and others like it are amenable to a traditional spreading analysis since every segment that has a nasal counterpart will be affected. However, Máihɨ̃ki, an endangered Western Tukanoan language spoken in Peru, exhibits a system of nasal harmony that is unique within Tukanoan (and perhaps globally) and cannot be accounted for using a traditional spreading analysis.

In Máihɨ̃ki nasal harmony, a floating morpheme-associated [NAS] feature preferentially docks to the leftmost voiced obstruent or, failing that, the leftmost vowel. Nasalization then "spreads" from a nasalized voiced obstruent, which surfaces as a nasal consonant, to the next voiced obstruent to the right in a morpheme, leaving any intervening vowels unaffected. Voiceless obstruents (and /g/, which descends from Proto-Western Tukanoan **k*) cannot nasalize. If the nasalization is on a vowel, it spreads to an adjacent vowel, and only /h/ acts as a transparent consonant (all others are opaque in this process). In both processes, the spread of nasalization is limited to occurring within a morpheme. The following examples illustrate these facts (with tone omitted).

(1) Voiced obstruents nasalize, doing so preferentially over vowels
   a. /[NAS]daso/ → naso 'monkey species'
   b. /[NAS]da͡ʒa/ → naɲa 'hair'
   c. /[NAS]a͡ʒa/ → aɲa 'snake'

(2) In the absence of a voiced obstruent, the leftmost vowel is nasalized
   a. /[NAS]eke/ → ẽke 'toad species' (NB: nasalization does not spread rightward to /e/)
   b. /[NAS]take/ → tãke 'monkey sp.'

(3) Nasalization spreads across vowels which are adjacent or separated only by /h/
   a. /[NAS]ao/ → ãõ 'food'
   b. /[NAS]gɨo/ → gɨ̃õ 'foot' (NB: /g/ cannot be nasalized)
   c. /[NAS]guhi/ → gũhĩ 'tooth' (NB: /h/ is transparent)

(4) Nasalization cannot spread across morpheme boundaries
   a. /[+nas]d͡ʒia-dai/ → ɲia-dai (*ɲia-nai) = see-come = 'visit'
   b. /bo-[+nas]d͡ʒaba/ → bo-ɲama (*mo-ɲama) = white-deer = 'white deer'

It is of crucial importance that no phonological contrast in nasality is possible on vowels after surface nasal consonants (which are underlyingly nasalized voiced stops), and aerodynamic evidence shows that these vowels are decidedly oral, exhibiting only slight co-articulatory nasalization. Under a traditional spreading analysis, vowels after a surface nasal consonant must be viewed as "skipped." However, it is difficult to motivate this "skipping" using markedness because nasalized vowels exist elsewhere in the language. This means that the "spread" of nasalization across voiced obstruents in Máihɨ̃ki is not nasalization spreading, but nasal consonant harmony (Hansson 2010). This nasal consonant harmony is in complementary distribution with the process of strictly local nasal spreading exemplified in (3).

The proposed analysis of nasal consonant harmony in Máíhɬ̃ki is developed in the Optimality Theoretic Agreement-by-Correspondence framework (ABC; Walker 2000a; Hansson 2010). First, CORR[+voi,-cont]$_{\mu}$ forces voiced stops within a morpheme (μ) to correspond. Ranked with this constraint is IDENT-IO/OI[voi, cont], which prevents voiced stops from escaping correspondence via dissimilation. The constraint that forces agreement in nasalization among corresponding segments is IDENT-XX[NAS]. These constraints are all ranked above IDENT-IO/OI[NAS], and this derives the basic nasal consonant harmony phenomena. To derive the basic strictly local nasal harmony phenomena, only one additional constraint is necessary. CORR[-cons]$_{X-X_{\mu}}$ forces correspondence among non-consonantal segments, which are defined as vowels and the glottal segments (here, only /h/). This constraint is undominated, and ranked together with CORR[+voi,-cont]$_{\mu}$. CORR[-cons]$_{X-X_{\mu}}$ sets up the necessary correspondence relation, and then the constraints already in place, namely IDENT-XX[NAS] and low-ranked IDENT-IO/OI[NAS], drive agreement in nasalization among the corresponding segments. The summary ranking which derives the core nasalization harmony phenomena is:

CORR[+voi,-cont]$_{\mu}$, CORR[-cons]$_{X-X_{\mu}}$, IDENT-XX[NAS] $\gg$ IDENT-IO/OI[NAS]

However, other constraints are necessary to derive properties of the harmony processes as they are attested in Máíhɬ̃ki. The inventory constraints *[DOR, NAS] and *[-voi, +cons, NAS] prevent [ŋ] and voiceless nasalized consonants, which are both unattested, from appearing as the result of harmony. The constraint MAXFLT([NAS]) prevents deletion of the floating nasalization feature. These constraints are undominated. To reflect the preference for nasalizing voiced stops instead of vowels while still allowing nasalized vowels to surface, *[-cons, NAS] is ranked below CORR[+voi,-cont]$_{\mu}$ and IDENT-XX[NAS]. Finally, to capture the fact that nasalization harmony originates on the left, the constraint ALIGN-L([NAS],μ) forces nasality to surface as close to the left edge of the morpheme as possible. However, forcing nasalization to surface on a voiced stop is more important than forcing it to surface to the left, so ALIGN-L([NAS],μ) is ranked below *[-cons, NAS]. This yields the final ranking below:

*[DOR, NAS], *[-voi, +cons, NAS], CORR[+voi,-cont]$_{\mu}$, CORR[-cons]$_{X-X_{\mu}}$, IDENT-XX[NAS] $\gg$ *[-cons, NAS] $\gg$ ALIGN-L([NAS],μ), IDENT-IO/OI[NAS]

The Máíhɬ̃ki nasal harmony system is unique within Tukanoan, and the analysis proposed here formally captures why that is the case: nasalization spreading between adjacent vowels operates side-by-side with a nasal consonant harmony system. The formal analysis establishes two separate correspondence relationships to account for this. The analysis also capitalizes on the insight that these processes are both "triggered" by a single morpheme-associated floating [+nas] feature, and uses only IDENT-XX[NAS] to motivate nasalization agreement. More importantly, however, this formal analysis is able to account simultaneously for two processes, long-distance consonant agreement and strictly local nasal spreading, that are generally viewed as theoretically incompatible and requiring separate analyses.

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