INTRODUCTION

- GSC optimizes two sets of constraints:
  - a set specifying a Harmonic Grammar, and
  - a set of quantization constraints that prefer discrete symbolic structures.
- Quantization strength \( q \) = dynamic
- increases during optimization so the system terminates in a discrete symbolic state.
- During optimization: blend states where multiple symbolic candidates are simultaneously present in the representation.
  - i.e., vowel height may be \([0.1, 0.9]\), a blend of 0.1[high] and 0.8[low], at some point of the computation.

PROPOSAL

Proper quantization rate: optimization terminates at the grammatical optimum, the symbolic state assigned highest harmony by the Harmonic Grammar.

Quantization improperly regulated: the progressively lower harmony of intermediate blend states traps the optimization process near locally optimal, globally suboptimal outputs.

→ We propose that this underlies counterbleeding patterns.

COUNTERBLEEDING IN YOKUTS

- Yowlumne Yokuts (California)
- High long vowels undergo lowering (1a,b)
- Long vowel shortening in closed syllables (1b, 2b).
- All other vowels surface faithfully in height and length (e.g., 2a).
- Both lowering and shortening when only shortening will do (1b).

\[
(1a) \quad /c'um/hun/ \rightarrow [/c'um]/\text{[low]} \\
(2a) \quad /do.so/ \rightarrow [/do.so]/\text{[low]}
\]

'might destroy' 'might report'

\[
(1b) \quad /c'um/hun/ \rightarrow [/c'um.hun]/\text{[low]}
\]

'destroys' 'reports'

- Interaction of 2 markedness constraints reduces opacity effects
- Opacity strongest when \( \text{LongHigh} \) operates alone
- Magnified by bad system dynamics (high \( q \))

INTUITION

Advantage of too many options: \( \text{LongHigh} \) better satisfied by shortening (suppress [long]) or by lowering (suppress [high]).

Advantage of blend states: greater combined amounts of [long] and [high] contribute to greater violation of \( \text{LongHigh} \). Suppress both [long] and [high] to better satisfy \( \text{LongHigh} \).

CONSTRANT INTERACTION?

- Counterbleeding: interaction of two patterns. Does this hold in GSC?
  - 3 feat. system; syll. opening/closing blocked by high-ranked constraint
  - Markedness only: \( \text{LONGHIGH} + \text{LONGCLOSED} \) w/ varying weights
  - Initial state: harmony maximum when \( q = 0 \) (= no input)
  - Optimization process: stochastic noise s.d. = 0.1, \( q \) at fixed value (1,000 simulations)

- Interaction of 2 markedness constraints reduces opacity effects

 week.q.val = 0.1; \( q \) at fixed value (1,000 simulations)

INTERACTION AT QUADRATIC CONSTRAINTS

\[
\begin{array}{c|c|c|c|c|c|c}
& 1 & 0 & 1 & 0 & 1 & 0 \\
\text{c'm+hun} & * & * & * & * & * & * \\
\text{c'm+hun} & * & * & * & * & * & * \\
\text{c'm+hun} & * & * & * & * & * & * \\
\text{c'm+hun} & * & * & * & * & * & * \\
\text{c'm+hun} & * & * & * & * & * & * \\
\text{c'm+hun} & * & * & * & * & * & * \\
\end{array}
\]

\( \text{Remark} / \text{Mark} / \text{Mark} / \text{Mark} / \text{Mark} / \text{Mark} / \text{Mark} \)

CONCLUSIONS

- An analysis of counterbleeding interactions is within the reach of GSC’s dynamic optimization over blend state representations.
- The resulting typology is at present insufficiently constrained, but there are promising avenues for future work.