CUMULATIVE CONSTRAINT INTERACTION AND THE EQUALIZER OF HG AND OT

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INTRODUCTION

Simple contrast and neutralization system.

- Idealized example of palatalization, following Carroll (2012); basic constraint types from McCarthy & Prince (1995, 1999).
  - **Specific markedness:** *si — violated by [si] sequences (i.e., unpalatalized consonants in palatalizing contexts).
  - **General markedness:** *ʃ — violated by [ʃ] (i.e., palatalized consonants generally).
  - **Faithfulness:** *s↔ʃ — violated by both /s/→[ʃ] and /ʃ/→[s] mappings (i.e., from palatalized to unpalatalized consonants and vice-versa).

Factorial typology.

Note: /a/ represents the complementary set of non-palatalizing contexts.

		/si/	/ʃi/	/sa/	/ʃa/	
1.	**Full Contrast**	[si]	[ʃi]	[sa]	[ʃa]	**OT & HG**
2.	**Contextual neutralization**	[ʃi]	[ʃi]	[sa]	[ʃa]	
3.	**Complementary distribution**	[ʃi]	[ʃi]	[sa]	[sa]	
4.	**Absolute neutralization**	[si]	[si]	[sa]	[sa]	
5.	**Reverse neutralization***	[si]	[ʃi]	[sa]	[sa]	**HG only**

Reverse neutralization emerges in HG due to **constraint ganging**: the summed weight of *s↔ʃ and *ʃ is greater than the weight of *si.

*attested in Gujarati; see Carroll (2012)

CONSTRAINT CONJUNCTION

Two possibilities for conjunctions of the form $C_1\&C_2(\ldots\&C_n)$:

$C_1\&C_2(\ldots\&C_n)$ is violated iff all conjuncts C_1, C_2, … C_n are violated…

<u>**Type 1:**</u> …anywhere within the candidate form.

In general, gang effects in HG behave like **Type 1** conjunctions.

Adding a **Type 1** conjunction $\mathbf{C_1\&C_2(\ldots\&C_n)}$ to an HG constraint set <u>**will not**</u> increase the size of its typology because it does not create any new distinctions between candidates.

Adding a **Type 1** conjunction $\mathbf{C_1\&C_2(\ldots\&C_n)}$ to an OT constraint set <u>**will**</u> increase the size of its typology because it distinguishes between dependent and independent conjunct violations.

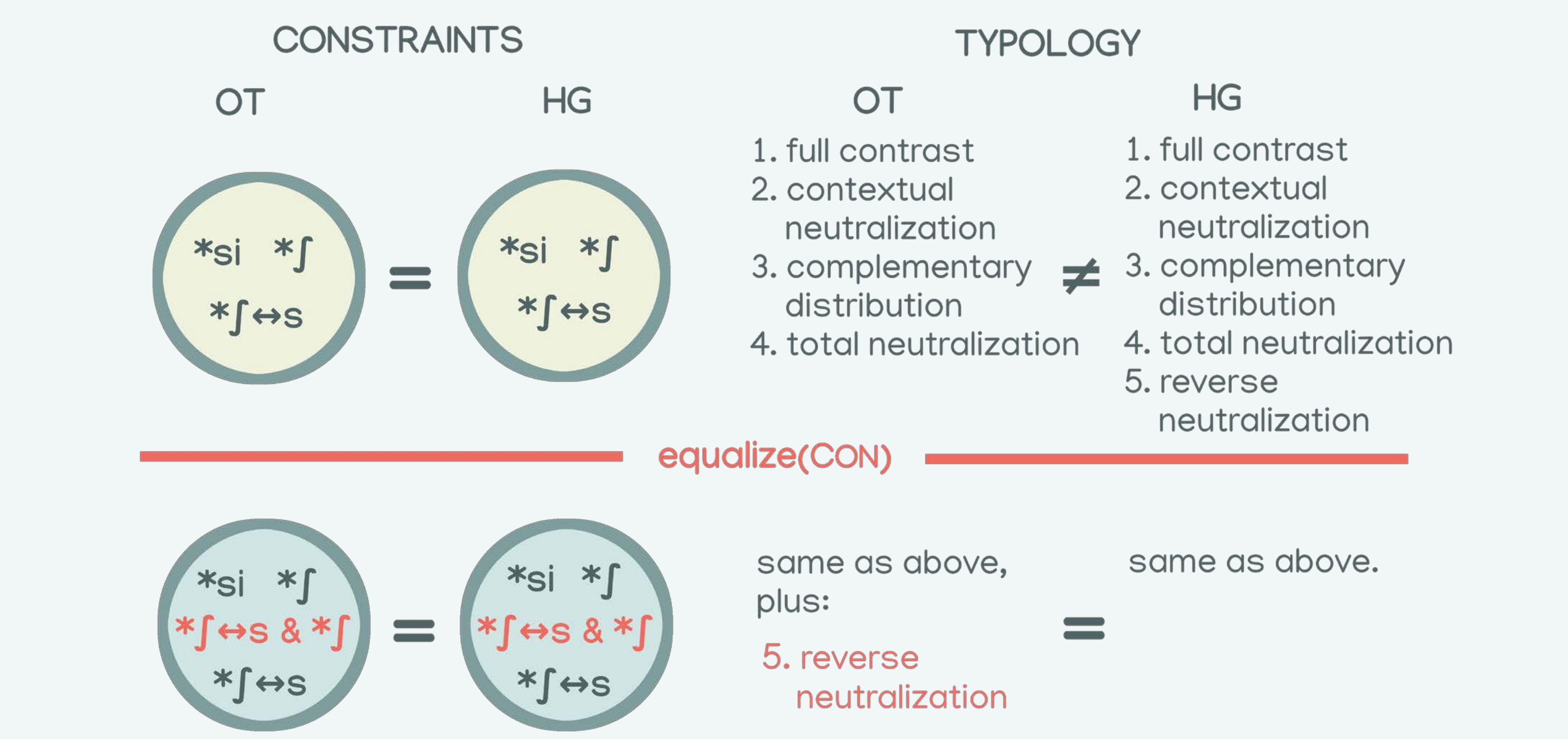
<u>**Type 2:**</u> …within a shared domain (i.e., segment, syllable, etc.).

Adding a **Type 2** conjunction $\mathbf{C_1\&C_2(\ldots\&C_n)}$ to an HG constraint set <u>**will**</u> increase the size of its typology because it distinguishes between domain-local and non-local violations of the conjuncts.

Adding a **Type 2** conjunction $\mathbf{C_1\&C_2(\ldots\&C_n)}$ to an OT constraint set <u>**will**</u> increase the size of its typology because it distinguishes between dependent and independent conjunct violations.

This distinction is orthogonal to our result; see Fukazawa & Miglio (1998), Padgett (2002), Lubowicz (2005), Legendre et al. (2006), and Pater (2016).

VISUAL ABSTRACT



EQUALIZE

```
1  # this algorithm takes a constraint set and a set of candidate sets as input and returns a
2  # minimally modified constraint set for which both HG and OT generate the same typology
3  def equalize(Con, csets):
4    for pattern in HG-Con_typ: # for each language in the HG typology on Con
5
6     # each tableau considers only contenders (Riggle 2004) to avoid an infinite loop on line 13
7     for cset in pattern:
8
9       # H_d is the highest weighted distinguishing constraint — see above right
10      H_d = the distinguishing constraint with the highest weight
11
12        if H_d does not prefer the winner:
13          for loser in cset:
14
15            # make a set of all winner-preferring distinguishing constraints that weigh less than H_d
16            conjuncts = {X_d in Con | X_d prefers the winner and w(H_d)>w(X_d)}
17
18            # create a conjoined constraint from the set of conjuncts
19            conjunction = conjoin(conjuncts)
20
21            # add the conjunction to the set of constraints
22            Con += conjunction
23
24   return Con
```

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DISTINGUISHING CONSTRAINTS

A **distinguishing constraint** is one "on which the optimum [= the winner, W] and some other candidate [= a loser, L] have differing violation scores." (Pater 2016)

In OT, the highest-ranking distinguishing constraint must prefer W to L. "A form which, for every pairwise competition involving it, best satisfies the highest-ranking constraint on which the competitors conflict, is *optimal*." (Grimshaw 1997)

In HG, the highest-weighted distinguishing constraint H_d needn't prefer W to L, iff W is preferred by some set of lower-weighted distinguishing constraints $\{X_d\}$ the summed weights * violations of which are greater than the weight * violations of H_d. (constraint ganging)

Identifying H_d and $\{X_d\}$ (lines 10–16), conjoining the members of $\{X_d\}$ (line 19), and adding the resulting conjunction to the constraint set (line 22) are thus critical parts of the **equalize** algorithm.

DISCUSSION

Summary.

Given a function Typ_{OT}(Con, csets) that maps a set of constraints and a set of candidate sets to a typology using Eval_{OT}, and

another function Typ_{HG}(Con, csets) that maps a set of constraints and a set of candidate sets to a typology using Eval_{HG}, then

the **equalizer** of Typ_{OT} and Typ_{HG} is the set of all (Con, csets) pairs for which Typ_{OT} and Typ_{HG} yield the same typology.

The proposed **equalize** algorithm takes (Con, csets) and returns an augmented Con for which OT and HG make the same typological predictions — a constraint set in the **equalizer** of OT and HG.

Although OT and HG do not in general predict the same typology, the existence of an **equalize** algorithm provides structure and substance to the intuition that OT and HG share considerable predictive overlap.

Extensions.

Symmetry vs. asymmetry.

In our idealized contrast and neutralization test case, the conjunction resulting from the application of the **equalize** algorithm, *s↔ʃ & *ʃ, is in all relevant respects equivalent to an *asymmetrical faithfulness constraint*, *s→ʃ. Adding the other member of the asymmetrical pair *ʃ→s has no effect on the typology, nor does subsequent removal of symmetrical *s↔ʃ.

Complementary constraint families.

Jesney (2016) shows that where OT requires both positional markedness (PM) and positional faithfulness (PF) constraints to describe patterns of disjunctive licensing (e.g., "voicing is licensed only in initial syllables or in onsets") and conjunctive licensing ("voicing is licensed only in initial syllable onsets"), HG can describe them with *either* PM *or* PF constraints. The results of these simpler HG systems can be replicated by applying the **equalize** algorithm to create conjunctions of PM or PF constraints.