Majority Rule in Harmonic Serialism

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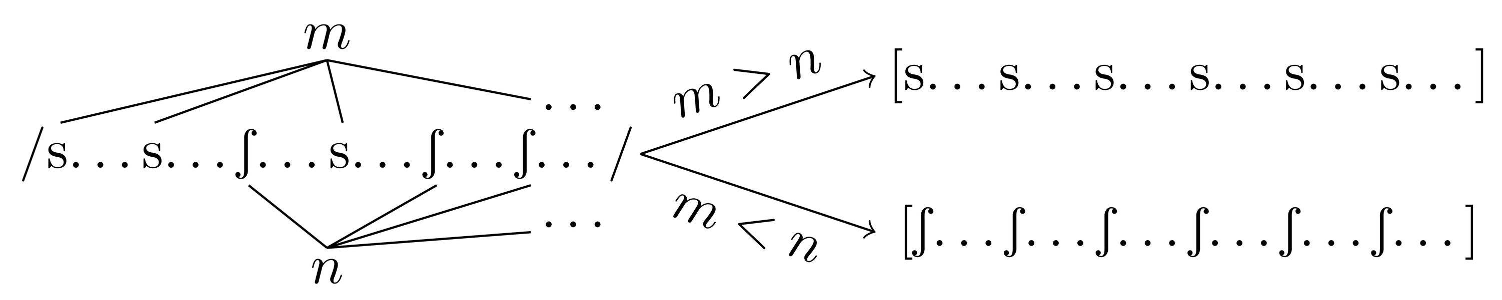
Introduction

Optimizing over constraints defined in terms of **precedence relations** produces pathologies

- Precedence relations define **subsequences**, objects without locality or adjacency
- Case study: requiring subsequences to agree yields **Majority Rule** in Harmonic Serialism
- Other cases: Midpoint pathology (Eisner, 1997, 2000) & Bubble Sort (Lamont, 2018)

Majority Rule largest class in the input controls agreement (Lombardi, 1999; Baković, 2000)

*technically *plurality* rule



- Running example: [s] cannot co-occur with [ʃ] (*s. . . ʃ, *ʃ. . . s); inputs with both /s/ and /ʃ/. . .
  - ⇒ . . . surface only with [s] if underlying there are more /s/ than /ʃ/ ($m > n$)
  - ⇒ . . . surface only with [ʃ] if underlying there are more /ʃ/ than /s/ ($m < n$)

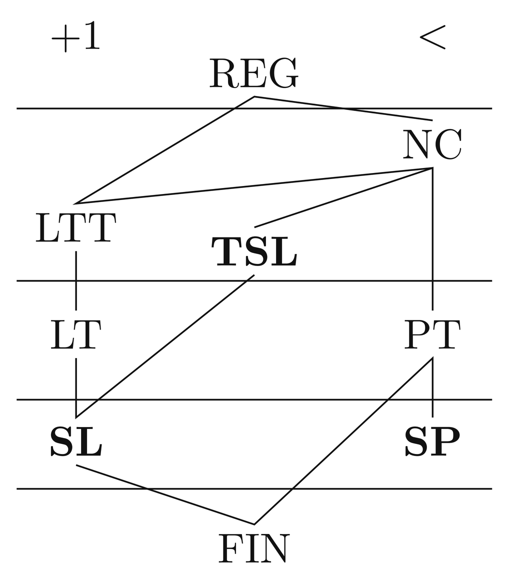
Majority Rule in parallel Optimality Theory

- Necessary ranking: AGREE constraint(s) ≫ IDENT constraint
  - ⇒ Constraints preferring one class must be ranked low enough as to be inactive
- In parallel OT, Majority Rule optimizes **faithfulness** constraints
  - ⇒ Candidates that satisfy AGREE compete in terms of IDENT
  - ⇒ Optimal candidate makes fewest changes, *minimally* violating IDENT
- All else equal, predicted whenever multiple unfaithful candidates satisfy output constraints

/ʃ . . . ʃ . . . ʃ . . . s . . . s/	CORR(SIB)	CC-IDENT(ANT)[GLOBAL ~ LOCAL]	IDENT(ANT)
a. ʃ . . . ʃ . . . ʃ . . . s . . . s	W 10		L
b. $ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$ . . . s_i . . . s_i		W 6 ~ W 1	L
→ c. $ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$			2
d. s_i . . . s_i . . . s_i . . . s_i . . . s_i			W 3

Why investigate subsequences?

- Phonotactic generalizations correspond to three subregular formal classes (Heinz, 2018)
  - **SL** bans marked substrings
  - **TSL** bans marked substrings on a tier } Long-distance phenomena
  - **SP** bans marked subsequences } Long-distance phenomena
- Provide well-defined hypothesis space for investigating classes of output constraints



REG	Regular
NC	Non-Counting
LTT	Locally Threshold Testable
TSL	Tier-based Strictly Local
LT	Locally Testable
PT	Piecewise Testable
SL	Strictly Local
SP	Strictly Piecewise
FIN	Finite
+1	Successor
<	Precedence

Majority Rule in Harmonic Serialism

- In HS, candidates only differ from the input via **at most one unfaithful operation**
- Unfaithful candidates can violate a given faithfulness constraint at most once
  - ⇒ No arbitrarily large differences in violations of any faithfulness constraint
  - ⇒ Mechanism that produces Majority Rule in parallel OT does not exist in HS
- Majority Rule is unexpected in HS, but it **optimizes globally evaluated CC-IDENT**

Global and local evaluation in Agreement by Correspondence

- CORR(SIB): Assign one violation for each pair of sibilants that do not correspond
- **CC-IDENT(ANT)**: Assign violations for *pairs* of correspondents disagreeing in [anterior]

Global evaluation: **every pair** of correspondents are possible loci

$ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$ . . . s_i . . . s_i (≈ **SP**)

Local evaluation: only **chain-adjacent pairs** of correspondents are possible loci

$ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$ . . . s_i . . . s_i (≈ **TSL**)

(Bennett, 2013, 2015; Hansson, 2001, 2007, 2010, 2014; Rose & Walker, 2004; Walker, 2000, 2015)

Globally evaluated CC-IDENT produces Majority Rule in HS

- Candidates with corresponding sibilants violate CC-IDENT(ANT) to various degrees
- Targeting member of minority class removes more loci than are added – **always optimal**

Step 1: /ʃ . . . ʃ . . . ʃ . . . s . . . s/	CORR(SIB)	CC-IDENT(ANT)[GLOBAL]	IDENT(ANT)
a. ʃ . . . ʃ . . . ʃ . . . s . . . s	W 10		L
b. $ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$ . . . s_i . . . s_i		W 6	L
→ c. $ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$ . . . s_i		4	1
d. $ʃ_i$ . . . $ʃ_i$ . . . s_i . . . s_i . . . s_i		W 6	1

Step 2: ʃ . . . ʃ . . . ʃ . . . ʃ . . . s	CORR(SIB)	CC-IDENT(ANT)[GLOBAL]	IDENT(ANT)
a. ʃ . . . ʃ . . . ʃ . . . ʃ . . . s	W 10		L
b. $ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$ . . . s_i		W 4	L
→ c. $ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$			1
d. $ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$ . . . s_i . . . s_i		W 6	1

Locally evaluated CC-IDENT cannot produce Majority Rule (or iterative harmony) in HS

- With local evaluation, each change creates as many new loci as are removed
- Iterative harmony is harmonically bounded (Wilson, 2003; Pater et al., 2007)

Step 1: /ʃ . . . ʃ . . . ʃ . . . s . . . s/	CORR(SIB)	CC-IDENT(ANT)[LOCAL]	IDENT(ANT)
a. ʃ . . . ʃ . . . ʃ . . . s . . . s	W 10		
→ b. $ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$ . . . s_i . . . s_i		1	
c. $ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$ . . . $ʃ_i$ . . . s_i		1	W 1
d. $ʃ_i$ . . . $ʃ_i$ . . . s_i . . . s_i . . . s_i		1	W 1

Directional Constraint Evaluation

- Globally-defined constraints motivate iterative spreading in HS, but also overgenerate
- Locally-defined constraints undergenerate, but represent intuitive generalizations
  - ⇒ Spreading as myopic (Wilson, 2003, 2006)
  - ⇒ Local exceptions in vowel harmony (Finley, 2010)
  - ⇒ Blocking in harmony and dissimilation (McMullin & Hansson, 2015; McMullin, 2016)

Iterative harmony with directional output constraints

- Under **directional evaluation**, loci are compared in terms of their *positions* (Eisner, 2000)
  - ⇒ Global constraints cannot pool large numbers of loci → **no Majority Rule**
  - ⇒ Local constraints can differentiate between loci → **yes iterative spreading**
- Output constraints are specified for directionality: R→L or L→R
  - ⇒ R→L evaluation disprefers loci **later** in candidates – further to the right is worse
  - ⇒ Relative position of loci defined over lexicographical order of segment indices

Step 1: /ʃ . . . ʃ . . . ʃ . . . s . . . s/	AGREE(SIB, ANT)$_{R→L}$			IDENT(ANT)
→ a. ʃ . . . ʃ . . . s . . . s . . . s		$σ_2σ_3$		1
b. ʃ . . . ʃ . . . ʃ . . . s . . . s	W		$σ_3σ_4$	L
c. ʃ . . . ʃ . . . ʃ . . . ʃ . . . s	W		$σ_4σ_5$	1

- Directional HS derivations resemble linear rule application (Johnson, 1972)
  - ⇒ Rightmost target repaired at each step, application proceeds strictly leftwards
  - ⇒ Each step is regular (Eisner, 2000); derivations seem to be as well (proof forthcoming)

Illustration: Ineseño Chumash directional harmony

Regressive sibilant harmony	/s-kamisa-tʃ/	→	[ʃkamiʃaatʃ]	'he wears a shirt'
Dissimilation between morphemes	/stumukun/	→	[stumukun]	'mistletoe'
	/s-tepuʔ/	→	[ʃtepuʔ]	'he gambles'
Dissimilation blocks & feeds harmony	/s-ti-yep-us/	→	[ʃtiyepus]	'he tells him'
	/s-is-tiʔ/	→	[ʃiʃtiʔ]	'he finds it'
(Applegate, 1972; McCarthy, 2007)	/s-iʃ-lu-sisin/	→	[ʃiʃlusisin]	'they went awry'

Step 1: /s-iʃ-lu-sisin/	IDENTTAIL	OCP	CRISPEDGE	AGREE(SIB,ANT)$_{R→L}$				IDENT
a. siʃlusisin				W	$σ_1σ_2$	$σ_2σ_3$		L
b. siʃlusiʃin	W1			W	$σ_1σ_2$	$σ_2σ_3$	$σ_3σ_4$	1
c. sislusisin		W1		L				1
d. sis͡lusisin			W1	L				1
e. siʃluʃisin				W	$σ_1σ_2$		$σ_3σ_4$	1
→ f. ʃiʃlusisin						$σ_2σ_3$		1

- Inconsistent with harmony as autosegmental spreading (McCarthy, 2007), ruling out a possible tier-based SHARE constraint (McCarthy, 2010)

Conclusion and Future Directions

- Output constraints over subsequences are too powerful; local constraints are underpowered
- Directional evaluation maintains local generalizations and the right amount of power
- Directional-dominant harmony systems (Cook, 1979; Mahanta, 2007; Ribeiro, 2002, 2012)
- Possible replacement of ALIGN–also over subsequences (McCarthy, 2003; Hyde, 2012, 2016)
- Are subsequence constraints ever empirically necessary?
- Theory-internal solution to divergent ties (Pruitt, 2009)
- Prove whether derivations are computationally regular