FAITH-UO: Analyzing Opacity in Harmonic Serialism

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1 Introduction

- HS captures some aspects of rule ordering. Processes can be forced to apply before others through constraint ranking. Certain types of opacity are analyzable in HS (McCarthy 2000, Elfner 2009).
- Counterfeeding opacity has continued to prove problematic.
- **Proposal:** a new class of faithfulness constraints which reference the underlying representation (UR) of forms within HS to account for opacity. This is unlike standard HS faithfulness constraints which require identity between the input and output of the current step of the derivation.
- **Implications:** contrast is emergent and does not have to be stipulated or listed in the grammar, counterfeeding opacity should not operate on derived segments (observed to our knowledge)

2 Counterfeeding Opacity in Harmonic Serialism

- Harmonic Serialism (HS) is a serial derivative of Optimality Theory in which GEN is limited to candidates that differ from the input by at most one change.
- The derivation is multistep; the output of EVAL at one step is the input at the following step.
- HS captures some of the aspects of rule ordering with serial candidate evaluation because processes can be forced to apply before others through constraint ranking. Because of this, HS provides a framework for analyzing certain types of opacity.
- Counterfeeding - for two ordered rules $\mathbb{A}$ and $\mathbb{B}$, where $\mathbb{A}$ precedes $\mathbb{B}$ in order of application, $\mathbb{B}$ COUNTERFEEDS $\mathbb{A}$ iff $\mathbb{B}$ would create additional inputs to $\mathbb{A}$, but does not due to order of application.
- Ex. Counterfeeding on focus in Bedouin Arabic: high vowels delete and low vowels become high in open syllables. Deletion applies before raising.
  - /ʃaribat/ → ʃarbat but /dafaʕ/ → difaʕ and not dfaʕ.
  - HS (and Parallel OT) predicts we should see /dafaʕ/ → dfaʕ, not the attested /dafaʕ/ → difaʕ.
- .

/dafaʕ/	*lo/C_]$_\sigma$X	*hi/C_]$_\sigma$X	MAX-IO	ID-IO[hi]	ID-IO[lo]
→ dfaʕ			*		
difaʕ		*!		*	*
dafaʕ	*!				

3 The Proposal: FAITH-UO

- Faithfulness constraints reference input-output mappings of the current stage of the derivation in HS.
- **FAITH-UO:** the proposed set of faithfulness constraints which demand faithfulness between the UR and the current output.
- A system of faithfulness constraints which refer to the UR at every step of the derivation captures the idea that speakers have access to the lexicon throughout the stages of a phonological derivation.

- **Defining FAITH-UO**
  - ID-UO(α)/[$\pm\beta$]
    Do not change the value of α for segments that are [$\pm\beta$] in the underlying representation.
  - In order to analyze counterfeeding opacity, α and β cannot be identical (the constraints are non-equality checking) – this is true for any OT-based analysis of chain shifts.

4 Analysis

- Basque: chain shift (CF on focus) on vowel height.

(1) **Basque** (Bakovic, 2010)
a. /alaba-a/ → alabe-a ↛ alabi-a
b. /seme-e/ → semi-e
ID-UO(hi)/[+low]

- The low vowel becomes mid but the second step of the chain shift to the high vowel is prevented by the higher ranking FAITH-UO constraint for height on segments which are [+low] in the UR.

(2) Step 1: /alaba-a/ → alabe-a

/alaba-a/	ID-UO(hi)/[+low]	*low/_V	*mid/_V	ID-IO(hi)
→ alabe-a				*
alaba-a		*!		

Step 2 alabe-a ↛ alabi-a:

/alaba-a/ alabe-a	ID-UO(hi)/[+low]	*low/_V	*mid/_V	ID-IO(hi)
→ alabe-a			*	
alabi-a	*!			

- The tableau below shows the second case in the Basque chain shift. Underlying mid vowels do shift to high vowels before a vowel because the top ranked UO constraint only assigns violations for segments which become high if they were [+low] in the UR.

(3) Step 1: /seme-e/ → semi-e

/seme-e/	ID-UO(hi)/[+low]	*low/_V	*mid/_V	ID-IO(hi)
→ semi-e				*
seme-e			*!	

4.1 Generalized constraint ranking for chain shifts

(4) FAITH-UO >> MARKEDNESS >> FAITH-IO

- This general ranking allows analysis of several examples of counterfeeding. Selected data and relevant UO faithfulness constraints are shown below.

(5) **Finnish** (Lubowicz, 2003)
/vapaa-ina/ → vapa-ina ↛ vapo-ina
/vapa-ina/ → vapo-ina
ID-UO(rd)/[+long]

(6) **Mwera** (Harries, 1950)
/m-pundo/ → m-bundo ↛ m-undo
/ŋ-gomo/ → ŋ-omo
MAX-UO/[-voice]

(7) **Bedouin Arabic** (Al-Mozainy, 1981)
/dafaʕ/ → difaʕ ↛ dfaʕ
/ʃaribat/ → ʃarbat
MAX-UO/[+low]

(8) **Polish** (Jensen, 2004)
/gmaxisko/ → gmaʃisko ↛ gmaɕisko
/naʃisko/ → naɕisko (theoretical)
ID-UO(palatal)/[+dorsal]

- **Chain shifts involving coalescence** are analyzable in our system (though it is necessary to set aside the more general question of how coalescence should be treated with faithfulness constraints).

(9) **Yawelmani** (Jensen, 2004)
/huwt-iws-a/ → huwt-u:s-a ↛ huwt-o:s-a
/ts'u:m-al/ → ts'o:m-al
ID-UO(hi)/[+dorsal]

- Referencing the [+dorsal] segment in the underlying representation or the [+front] vowel in the underlying representation will cause the same effects. The undesired mapping of huwt-u:s-a ↛ huwt-o:s-a will be prevented in both cases.
- **Multi-step chain shifts**: analyzed by incorporating multiple FAITH-UO constraints for the problematic steps.
- . **Nzebi** (Kirchner, 1996)
/sal/ → sɛl ↛ sel ↛ sil
/bɛd/ → bed ↛ bid
/bet/ → bit
- Constraints required:
ID-UO(ATR)/[+low]
ID-UO(hi)/[-ATR]

Multi-step chain shifts: analyzed by incorporating multiple FAITH-UO constraints for the problematic steps.

(10) **Nzebi** (Kirchner, 1996)
/sal/ → sɛl ↛ sel ↛ sil
/bɛd/ → bed ↛ bid
/bet/ → bit

(11) Step 2 of /sal/ → sɛl ↛ sel ↛ sil

/sal/ sɛl	ID-UO(ATR)/[+low]	ID-UO(hi)/[-ATR]	RAISE	ID-IO(hi)	ID-IO(ATR)
→ sɛl			*		
sel	*				*
sil	*	*		*	*

- Here, the output converges on [sɛl]. The candidate [sel] loses by violating a FAITH-UO constraint, and the candidate [sil] that raises further is harmonically bounded.
- Under this analysis, faithfulness to the underlying form as the mechanism behind chain shift patterns, and purpose behind implementation of FAITH-UO constraints. The more steps which separate a candidate from the original underlying form, the more violation marks it acquires on the FAITH-UO constraints.

5 Comparison with other analyses

- Lubowicz (2003): Chain shifts analyzed through constraints which specifically demand contrast preservation. In our system, contrast is emergent.
- OT-CC (McCarthy 2010): Has access to all steps of the derivation simultaneously. Our approach is strictly local to each step of the derivation in HS and does not utilize look-ahead.

6 Implications

- Non-equality checking FAITH-UO constraints permit the analysis of chain shifts in Harmonic Serialism by requiring faithfulness to a particular feature 'A' in a particular class of segments 'B'.
- Emergent contrast: Because they require faithfulness to a feature of the underlying representation, they effectively require preservation of an underlying feature contrast. Thus, contrast preservation is an emergent property of a system with FAITH-UO constraints.
- Prediction: There should be no chain shifts (CF on focus) which manipulate noncontrastive features, such as stress (in some cases), allophonic alternations, or syllable structure, since these elements are not present in the underlying representation. To our knowledge, this prediction is observed.

7 Conclusion

- Proposal: a new set of constraints in HS that can account for cases of opacity
- FAITH-UO constraints demand faithfulness to the underlying representation at all stages of the derivation
- Results: CF opacity analyzed in HS, contrast emerges from constraint interaction, no separate grammatical framework for contrast is needed

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