Class 23
A Brief Introduction to Harmonic Serialism

5/10/18

1 Basics of Harmonic Serialism

Classical Optimality Theory = "Parallel OT" (P-OT)

Harmonic Serialism (HS) = "Serial OT" ($\neq$ Stratal OT)

- Harmonic Serialism (McCarthy 2000, 2010, 2016; McCarthy & Pater 2016) is a version of Optimality Theory (already entertained by Prince & Smolensky 2004 in the original paper).
  - ○ HS employs the three basic components of (P-)OT: GEN, CON, EVAL
  - ○ CON is essentially the same in both versions:
    - ■ The constraints are the same (i.e. the constraint language, how we reason about constraints).
    - ■ (more importantly) There is a **single, consistent constraint ranking** throughout the derivation.

→ The differences between P-OT and HS are in the nature of GEN and eval, and the way they interact.

- The two defining characteristics of HS (in distinction to P-OT) are:

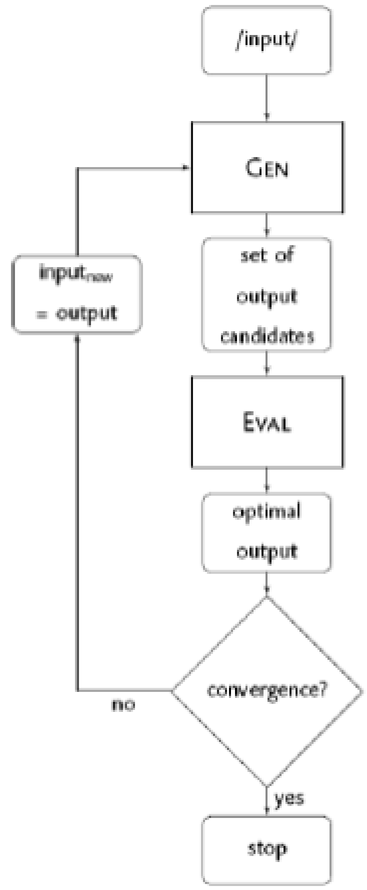
(1) a. **Gradualness:** GEN is restricted — the candidate set consists only of candidates which differ from the input by "one change"/"one operation".
↪ It is part of the research program of HS to determine what counts as a single change/operation.[1]

b. **Serialism:** EVAL is iterated — the candidate selected by EVAL is entered into a new round of computation (until "convergence").
↪ The HS derivation stops ("converges") when the faithful candidate is selected by EVAL, i.e. there are no more changes which can improve the output given the constraint ranking.

- Basically: the difference between HS and P-OT is the nature of the *input→output* mapping.
  - ○ P-OT does it in one step, considering all the candidates.
  - ○ HS does it in (potentially) multiple steps, at each step considering only a restricted set of logically-possible candidates.

[1] This ends up being a shortcoming of the literature, because different papers frequently make different(/incompatible?) assumptions/claims about what is or is not a single operation.

(2) HS flowchart (McCarthy 2016:3)



- Note how this is different than Stratal OT: Stratal OT chains (a limited number of) GEN-unrestricted parallel evaluations, where the ranking of constraints may change freely between evaluations (levels/strata).
  - This shares the property with HS of allowing the derivation access to intermediate forms.
  - But the possibility of re-ranking between levels allows Stratal OT greater freedom in process interaction than HS (which may or may not be a good thing).

- Given that there is a single constraint ranking that is held constant across each evaluation, but only one change can be made at a time, HS is essentially a way of doing process ordering through constraint ranking rather than rule ordering.
  - Changes to the input are only motivated when some $\mathbb{M} \gg \mathbb{F}$.
  - The highest ranked $\mathbb{M}$ gets satisfied first, then the second highest ranked $\mathbb{M}$, and so on, until no more changes can be made that don't violate higher ranked $\mathbb{F}$'s.

→ But note that it does not on its own generally solve opacity (McCarthy 2016:§8; see, e.g., Jarosz 2014 on special ways to deal with opacity in HS.)

2 Epenthesis in Classical Arabic (proof of concept)

2.1 Background

- **Fact 1:** Classical Arabic (for the most part) doesn't allow consonant clusters word-initially.
  - It fixes #CC by epenthesizing [ʔi] before the cluster.
- **Fact 2:** Classical Arabic also doesn't allow onsetless syllables.
  - #V repaired by epenthesizing [ʔ] before the V.

- These facts can be modeled in P-OT by saying that [ʔi]-epenthesis happens in one fell swoop.
  - The same ranking will also capture simple [ʔ]-epenthesis for the #V case.

→ With the same constraints, HS can model [ʔi]-epenthesis serially as [i]-epenthesis followed by [ʔ]-epenthesis (McCarthy 2010:3–4, 2016:3–5).
  - e.g. /fʕal/ → *ifʕal* → [ʔifʕal]

2.2 P-OT derivation

- High-ranked *COMPLEXONSET triggers repair (rules out (3a)).
- MAX ≫ DEP means epenthesis preferable to deletion (rules out (3b)).
- CONTIGUITY ≫ ONSET means pre-cluster epenthesis is preferable to internal epenthesis, even if it were to create an onsetless syllable (rules out (3c)).
- ONSET ≫ DEP means the would-be onsetless syllable is further repaired through epenthesis (picks (3e) over (3d)).

(3) [ʔi]-epenthesis in one fell swoop in P-OT

/fʕal/	*COMPLEXONS	MAX	CONTIGUITY	ONSET	DEP
a. fʕal	*!				
b. ʕal		*!			
c. fiʕal			*!		*
d. ifʕal				*!	*
e. ☞ ʔifʕal					**

2.3 HS derivation

⋆ HS basically works the same way, but it deprives itself of the ultimate winning candidate on the first step because it makes two changes ([ʔ]-epenthesis + [i]-epenthesis).

- The input to the first round of EVAL is the cluster-initial root: /fʕal/
- GEN provides all the candidates which make "one change" (and no change — i.e. the faithful candidate) relative to *this* input:
  - Deletion of one segment: [ʕal], [fal], etc. [*modulo* McCarthy (2008)]
  - Insertion of one segment: [ifʕal], [fiʕal], [ʔfʕal], etc.
  - Change of one(ish) feature: [*u*ʕal], [f*a*al], etc.
  - Metathesis(?): [faʕl], [falʕ](?), etc. [not according to Takahashi (2018)]

- These are the candidates entered into the initial evaluation.
  - ⋆ The candidate chosen in the P-OT evaluation (and in the last step of the HS derivation) — ʔifʕal ((4✗) = (3e)) — is not available in the initial evaluation, because it makes *two changes* relative to the input.
- Given the ranking in (4), we select the candidate that repairs the initial cluster (satisfying highest ranked *COMPLEXONS) through vowel epenthesis.
  - ○ This introduces a new markedness violation (ONSET), but this is tolerated due to ranking.

(4) Step 1 (vowel epenthesis): /fʕal/ → *ifʕal*

/fʕal/	*COMPLEXONS	MAX	CONTIGUITY	ONSET	DEP
a. fʕal	*!				
b. ʕal		*!			
c. fiʕal			*!		*
d. ☞ ifʕal				*	*
✗ ʔifʕal					**

- It is an interesting property of this derivation (applicable to HS generally) that it has selected an intermediate form which violates a surface true markedness constraint of the language (ONSET), and has in fact actively introduced that violation.

⋆ NB: We need CONTIGUITY to rule out (4c).
  - ○ In at least some work on HS, there is a desire to link faithfulness constraints directly to operations (e.g. MAX = don't perform a deletion operation, DEP = don't perform an insertion operation, etc.).
  - ○ Constraints like CONTIGUITY or ANCHOR don't fit nicely into this logic.

- Once Step 1 selects [ifʕal] as the most *most harmonic available candidate*, that candidate becomes the input to a new round of evaluation.
  - ○ The candidate set is now different, because it is derived relative to the new input //ifʕal//, not the original input /fʕal/.
  - ○ Furthermore, faithful violations are assessed differently for equivalent candidates, since they are being reckoned relative to a different input.

→ Now the [ʔ]-epenthesis candidate is available, because it is only one change away from the new input.
  - ○ Since ONSET ≫ DEP, the ONSET violation introduced on the last step can be repaired.

(5) Step 2 ([ʔ] epenthesis): //ifʕal// → *ʔifʕal*

//ifʕal//	*COMPLEXONS	MAX	CONTIGUITY	ONSET	DEP
a. ifʕal				*!	
b. fʕal	*!	*!			
c. ☞ ʔifʕal					*

- This candidate is now the input to another round of evaluation.
  - Given the ranking, there are no more problems that can be fixed.
  - Any additional markedness violations (e.g. *CC) are too low ranked (i.e. below faithfulness) to be able to induce more changes.
  - The faithful candidate is selected, so the derivation converges and ends, and this candidate ends up as the output form.

(6) Step 3 (convergence): //ʔifʕal// → [ʔifʕal]

//ʔifʕal//	*COMPLEXONS	MAX	CONTIGUITY	ONSET	DEP	*CC
a. ☞ ʔifʕal						*
b. ifʕal		*!		*		*
c. ʔifiʕal			*!		*	
d. ʔiʕal		*!	*!			

- We don't gain anything by using HS with this case, but it shows that the framework can derive the facts.

3 Coda assimilation/deletion (an actual result)

3.1 The claim

- One result of HS that I kind of like is how it captures the typology of coda assimilation/deletion effects (McCarthy 2008, 2011).

- McCarthy claims that:

(7) a. Place assimilation is (virtually) always regressive (i.e. targets codas)
b. Consonant deletion always targets codas over onsets
c. These conditions can be (must be?) reversed when the onset is a laryngeal (which lacks place)

- According to McCarthy, this can be explained more easily (or maybe exclusively) through serial derivation than parallel derivation.

3.2 Pieces of the analysis

- **Piece #1:** There is an inherent asymmetry between the markedness of place (or place contrasts) between onset position (i.e. prevocalic) and coda position (i.e. non-pre-vocalic).

(8) CODACONDITION:
Assign one violation mark for every token of Place that is not associated with a segment in the syllable onset. (McCarthy 2008:279)

- **Piece #2** — McCarthy's claim: you can't directly delete a segment with a place specification.
  - It is one operation in HS to delete the place node.
  - It is another, separate operation in HS to delete a segment without a place node.

⋆ This is going to pose a problem for STS for cluster reduction in reduplication (Zukoff 2017; cf. McCarthy, Kimper, & Mullin 2012), and perhaps onset cluster reduction generally.

- **Piece #3:** It's marked for segments to not have place:

(9) HAVEPLACE:
Assign one violation mark for every segment that has no Place specification. (McCarthy 2008:279)

3.3 Results

3.3.1 The coda/onset asymmetry in consonant deletion

- If HAVEPLACE ≫ CODACONDITION, coda consonants will have to be retained faithfully, because place-deletion to satisfy CODACONDITION would violate higher-ranked HAVEPLACE.
  - (If CODACONDITION ≫ DEP, you could still get epenthesis under this ranking.)
- But if CODACONDITION ≫ HAVEPLACE & MAX[Place], you will get deletion of the coda consonant's place node.
  - ⋆ Crucially, the segment deletion candidate(s) (10✗) are not available yet.

(10) Step 1 (Place deletion)

/patka/	CODACONDITION	DEP	HAVEPLACE	MAX[Place]	MAX
a. patka	*!				
b. ☞ paHka			*	*	
c. patHa	*!		*	*	
d. patika		*!			
✗ paka				*	*
✗ pata				*	*

- Once you have a placeless segment in coda position, you can delete that on the next step.

(11) Step 2 (H deletion) [followed by convergence]

//paHka//	CODACONDITION	DEP	HAVEPLACE	MAX[Place]	MAX
a. paHka			*!		
b. paHika		*!	*		
c. ☞ paka					*
✗ pata		*		*	*

  - ○ Reversal of HAVEPLACE and MAX yields languages where codas reduce to placeless segments (placeless nasals, and glottal stops/fricatives). Such languages are attested.

- But we have passed the point where the original coda consonant can surface (i.e. (11✗)).

→ Therefore, under this approach, you will never be able to delete a (place-full) onset consonant to resolve CODACONDITION.

3.3.2 The coda/onset asymmetry in place assimilation

- Place assimilation follows the same first step as in the coda consonant deletion derivation, but fixes HAVEPLACE through place linkage to the following onset at Step 2.

(12) Step 1 (Place deletion)

/pamta/	CODACOND	DEP	HAVEPLACE	MAX[Place]	MAX	DEP[Link]
a. pam.ta	*!					
b. ☞ paN.ta			*	*		
c. pam.Ha	*!		*	*		
d. pamita		*!				
e. pam͡n.ta	*!					*
✗ pan.ta				*		*

- ○ We might want to worry about [pam.p͡ta], where the onset consonant is doubly articulated to save the coda place. This could probably be ruled out by constraints on complex segments, but might be worrisome for the typology.

(13) Step 2 (Place linking) [followed by convergence]

//paN.ta/	CODACOND	DEP	HAVEPLACE	MAX[Place]	MAX	DEP[Link]
a. paN.ta			*!			
b. ☞ pan.ta						*
c. pata					*!	
d. paNita		*!	*			

- Place assimilation will thus be regressive, happening only to repair the placelessness which was the fix for CODACONDITION.

3.3.3 Reversal with glottals

- C+glottal clusters can resolve through deletion of the glottal because glottals lack a place node.
  - ○ Deletion of the glottal lets the coda resyllabify as an onset.
  - ○ This requires that syllabification is not an independent operation (i.e. it comes for free when you perform other operations).
  - ⋆ This is what McCarthy (2016) argues for; but this is the kind of assumption that different HS papers have differed on in potentially untenable ways.

(14) /h/-deletion from postconsonantal onsets in Tonkawa (McCarthy 2008:284)

underlying	surface	gloss
nes-**h**e-tsane-oʔs	ne.sets.noʔs	‘I cause him to lie down’
nes-**h**a-na-kapa-	ne.san.ka.pa-	‘to cause to be stuck’

(15) Post-C glottal deletion in Tonkawa

/nesha.../		MAX[Place]	DEP	CODACONDITION	MAX	HAVEPLACE
a.	nes.ha...			*!		*
b.	neh.ha...	*!				**
c. ☞	ne.sa...				*	

4 Brief conclusions

- HS can do much of what P-OT can do.
- HS can in some cases derive different results because of the ways in which it is restricted, mostly having to do with the unavailability of candidates, based on its gradualness requirement.

→ The places where HS gets results from its architecture can largely be characterized as cases where you want to prevent the grammar from *looking ahead* and seeing that it could fix multiple problems at once. HS practitioners tend to claim this kind of look ahead doesn't exist.

⋆ But there are some cases where the phonology seems to need look ahead ("irreducible parallelism"; Adler & Zymet 2017).
  - ◦ For example, anti-gemination in Lithuanian: you only know to do epenthesis if you can see the upcoming result of assimilation. Also, Mbe reduplication Wei (2018).

- It's unclear whose results are better...

References

Adler, Jeff & Jesse Zymet. 2017. Irreducible Parallelism in Phonology. In Andrew Lamont & Katerina Tetzloff (eds.), *NELS 47: Proceedings of the Forty-Seventh Annual Meeting of the North East Linguistic Society*, vol. 1, 31–44. Amherst, MA: Graduate Linguistics Student Association. http://lingbuzz.auf.net/lingbuzz/003673.

Jarosz, Gaja. 2014. Serial Markedness Reduction. In John Kingston, Claire Moore-Cantwell, Joe Pater & Robert Staubs (eds.), *Proceedings of the 2013 Meeting on Phonology*, Washington, DC: Linguistic Society of America. https://journals.linguisticsociety.org/proceedings/index.php/amphonology/article/view/40.

McCarthy, John J. 2000. Harmonic Serialism and Parallelism. In Masako Hirotani, Andries Coetzee, Nancy Hall & Ji-yung Kim (eds.), *NELS 30: Proceedings of the North East Linguistic Society*, 501–524. Amherst, MA: Graduate Linguistics Student Association. https://works.bepress.com/john_j_mccarthy/79/.

———. 2008. The Gradual Path to Cluster Simplification. *Phonology* 25(2):271–319.

———. 2010. An Introduction to Harmonic Serialism. *Language and Linguistics Compass* 4(10):1001–1018. http://works.bepress.com/john_j_mccarthy/103.

———. 2011. Perceptually Grounded Faithfulness in Harmonic Serialism. *Linguistic Inquiry* 42(1):171–183.

———. 2016. The Theory and Practice of Harmonic Serialism. In John J. McCarthy & Joe Pater (eds.), *Harmonic Grammar and Harmonic Serialism*, 47–87. London: Equinox Publishing. https://works.bepress.com/john_j_mccarthy/112/.

McCarthy, John J., Wendell Kimper & Kevin Mullin. 2012. Reduplication in Harmonic Serialism. *Morphology* 22(2):173–232.

McCarthy, John J. & Joe Pater (eds.). 2016. *Harmonic Grammar and Harmonic Serialism*. UK: Equinox Publishing.

Prince, Alan & Paul Smolensky. 2004. *Optimality Theory: Constraint Interaction in Generative Grammar*. Malden, MA: Blackwell Publishing. Updated version of Rutgers University Cognitive Science Cener Technical Report TR-2 1993.

Takahashi, Chikako. 2018. No Metathesis in Harmonic Serialism. In Gillian Gallagher, Maria Gouskova & Sora Yin (eds.), *Supplemental Proceedings of the 2017 Annual Meetings on Phonology*, Washington, DC: Linguistic Society of America. https://journals.linguisticsociety.org/proceedings/index.php/amphonology/article/view/4232.

Wei, Wei. 2018. Lookahead Effect in Mbe Reduplication. In Gillian Gallagher, Maria Gouskova & Sora Yin (eds.), *Supplemental Proceedings of the 2017 Annual Meetings on Phonology*, Washington, DC: Linguistic Society of America. https://journals.linguisticsociety.org/proceedings/index.php/amphonology/article/view/4243.

Zukoff, Sam. 2017. Actually, Serial Template Satisfaction Does Predict Medial Coda Skipping in Reduplication. In Karen Jesney, Charlie O'Hara, Caitlin Smith & Rachel Walker (eds.), *Supplemental Proceedings of the 2016 Annual Meetings on Phonology*, Washington, DC: Linguistic Society of America. https://journals.linguisticsociety.org/proceedings/index.php/amphonology/article/view/3983.