Contexts for Epenthesis in Harmonic Serialism[1]

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1 Intro

- Epenthesis is used as a repair for only some types of markedness
- In particular, metrical markedness is not repaired by epenthesis
- A restriction on Gen is proposed within the framework of Harmonic Serialism to capture this generalization
- With this restriction, some forms which are more harmonic than their inputs are inaccessible - there is no derivational path that can lead to them
- This is an instance of a solution to a too-many-repairs problem

2 Typology of Epenthesis-triggering environments

1. Broselow (1982) argues that epenthesis can resolve three types of markedness
   - Syllabic markedness

     (1) **Swahili:** Obstruents not permitted in codas
     tiket ∼ tiket**i** *ticket*
     ratli ∼ rat**i**li *pound*

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- Segmental markedness

  (2) **Winnebago:** (Dorsey's Law) Obstruent-sonorant sequences forbidden
  hoʃwaʒa → hoʃ**a**waʒa *be sick, 2pl*

  (3) **Mohawk:** Consonant + glottal stop clusters forbidden
  o+nʌst+ʔ→ onʌst**e**ʔ *corn, nom.*

  (4) **English plural:** Epenthesis breaks up sequences of sibilants
  bɹʌʃ+ z → bɹʌʃ**ɨ**z

- Prosodic markedness (Word Minimality)

  (5) **Mohawk:** Monosyllabic words forbidden
  k+ek+s → **i:**keks *I eat*

- There are standard analyses in Parallel OT using well-motivated constraints to produce all of these types of patterns.

2. As noted by Blumenfeld (2006), some kinds of prosodic markedness are not resolved by epenthesis

Notation:
Syllable boundaries are indicated by parentheses ()
Foot boundaries are indicated by brackets [ ]
Prosodic Word boundaries are indicated by braces { }
Unparsed segments are indicated by <>

- Epenthesis is not used to avoid stress lapse
  - Rankings of well-motivated metrical markedness constraints exist that produce this pattern
  - Specifically, when the Weight-to-stress principle (WSP) is high-ranked and *Lapse outranks Dep

(6) Constraint definitions:

a. WSP: Assign a violation to every heavy syllable which is not stressed. (Prince and Smolensky, 1993/2004)

b. *Lapse: Assign a violation to any pair of adjacent unstressed syllables. (Kager, 1993)

c. Dep: Assign a violation to any segment in the output that has no input correspondent

(7) WSP,*Lapse ≫ Dep

/bakdupikibti/	WSP	*Lapse	Dep
a. (bak) [(dú)(pi)] [(kíb)(ti)]	*!		
b. [(bák)(du)] (pi) [(kíb)(ti)]		*!	
→ d. [(bák)(du)] [(pí)(**ʔi**)] [(kíb)(ti)]			*

– A syllable is epenthesized and a foot built around it just in case satisfaction of the WSP results in a stress lapse.

– Surface alternations in a language that does this would look like:

(8) Epenthesis repairs lapses (unattested):

a. /baduk/ → [(ba)(dúk)]

b. /baduk + pikit/ → [(ba)(dúk)][(pi)(kít)]

c. /batki/ → [(bát)(ki)]

d. /batki + pikit/ → [(bát)(ki)][(pí)(**ʔə**)][(kít)] *[(bát)(ki)][(pi)(kít)]

- Violations of Nonfinality are not resolved by epenthesis

(9) Nonfinality: Assign a violation to any stressed syllable which is final in the prosodic word (Prince and Smolensky, 1993/2004)

(10) Epenthesis repairs nonfinality (unattested):

a. /batki/ → {[(bát)(ki)]}

b. /batki + ta/ → {[(bát)(ki)](ta)}

c. /baduk/ → {[(ba)(dúk)](**ʔə**)}, *{[(ba)(dúk)]}

d. /baduk + ta/ → {[(ba)(dúk)](ta)}

– Epenthesis of a vowel between the heavy syllable and the edge of the Prosodic Word avoids a violation of Nonfinality

(11) WSP, NONFINALITY ≫ DEP

/baduk/	WSP	NONFINALITY	DEP
a. {[(bá)(duk)]}	*!		
b. {[(ba)(dúk)]}		*!	
→ c. {[(ba)(dúk)]ə}			*

- Violations of FTBIN are not resolved by epenthesis

(12) FTBIN: Assign a violation to every foot which is not binary (which does not have two syllables) (Prince and Smolensky, 1993/2004)

– McCarthy (1986) argued that epenthesis to resolve word-subminimality as in (5) is actually to resolve foot-subminimality: prosodic words must have at least one foot, and material is epenthesized if the word is not big enough to satisfy FTBIN – More on this later.

– But a language which parses all syllables into feet and epenthesizes material to repair degenerate feet, even in larger words, is not attested.

– In such a language, all words would have an even number of syllables.

(13) Epenthesis repairs subminimal feet (unattested):
a. /bata/ → [(bá)(ta)]
b. /bataka/ → [(bá)(ta)][(ká)(**ʔə**)]

(14) PARSE-SYLL, FTBIN ≫ DEP

/bataka/	PARSE-SYLL	FTBIN	DEP
a. [(bá)(ta)](ka)	*!		
b. [(bá)(ta)][(ká)]		*!	
→ c. [(bá)(ta)][(ká)(**ʔə**)]			*

- Violations of *CLASH are not resolved by epenthesis

(15) *CLASH: Assign a violation to any pair of adjacent stressed syllables (Kager, 1993)

(16) Epenthesis repairs clashes (unattested):
a. /baduk/ → [(ba)(dúk)]
b. /baduk+ti/ → [(ba)(dúk)](ti)
c. /baduk + kit/ → [(ba)(dúk)](**ʔə**)[(kít])

- This language is unattested
- But well-motivated constraints in Parallel OT produce it:

(17) WSP, *Clash ≫ Dep

/baduk + kit/	WSP	*Clash	Dep
a. [(ba)(dúk)](kit)	*!		
b. [(ba)(dúk)][(kít)]	*!		
→ c. [(ba)(dúk)](ʔə)[(kít)]		*!	

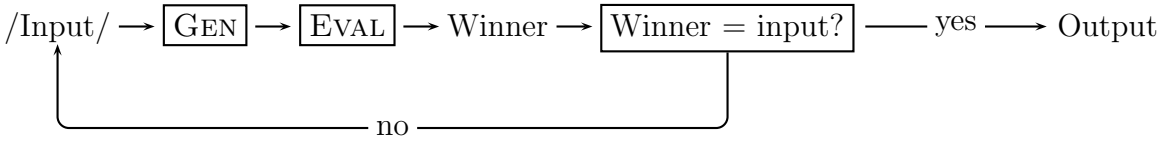
3 Harmonic Serialism

3. Harmonic Serialism (HS) is a serial constraint-based framework

- In Parallel OT (Prince and Smolensky, 1993/2004), Gen creates a large (countably infinite) set of candidates, formed by the free application and combination of many operations. Eval chooses the optimal candidate from this large set - this is the output.
- HS is a variant of OT in which Gen produces a small set of candidates, each at most 'one change' away from the input (Prince and Smolensky, 1993/2004,McCarthy, 2007, *et. seq.*)
  - Gen produces a set of candidates for a given input
  - Eval chooses a winner from that set of candidates, and sends that winner back to Gen as its new input
  - The derivation converges when the winner chosen by Eval is identical to the input to that stage - this winner is the output

(18) **Parallel optimization**

(19) **Serial optimization**



4. HS derivations must be *harmonically improving*

   - The overall harmony of the output must increase with each derivational stage
   - Because of this, a derivation can never reach some outputs because there is no harmonically improving path to them

5. What counts as 'one change'?

   - This is a main topic of research in HS (McCarthy, 2010)
   - I'll be presenting arguments regarding the contents of Gen below.

4 Eliminating epenthesis pathologies in HS

6. Restricting Gen

   Main Idea: Epenthesis and parsing into prosodic structure are separate steps

- Epenthesis of a segment is an operation in Gen

(20) Epenthesis: Insert a segment at any linear position in the input string.
For Example:

Input:	batka
Candidates:	**ə**batka
	b**ə**atka
	ba**ə**tka
	bat**ə**ka
	⋮

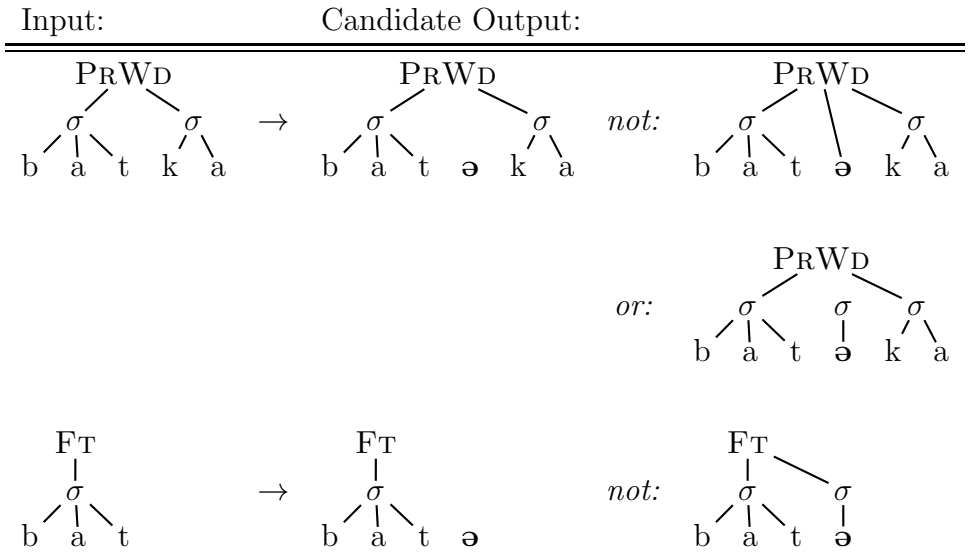
- This operation can be used to resolve segmental markedness constraints such as those mentioned in (4) above

(21) **English Plural:** OCP-sibilant ≫ Dep

	/bɹʌʃ+ z/	OCP-sibilant	Dep
→ a.	bɹʌʃəz		1
b.	bɹʌʃz	1W	

- But an epenthesized segment can't be simultaneously parsed into prosodic structure
- If a segment is epenthesized into a string with some prosodic structure, it is left out of that structure:

(22) **Epenthesis in action**



- Parsing into prosodic structure can come in subsequent steps

(23) **Parsing into prosodic structure**

Input		Epenthesis		Syllabification		Parsing I		Parsing II
{(bat)(ka)}	→	{(bat)<ə>(ka)}	→	{(bat)<(ə)>(ka)}	→	{(bat)(ə)(ka)}		
[(bát)]	→	[(bát)]ə	→	[(bát)](ə)	→	[(bát)(ə)]		
{[(bát)]}	→	{[(bát)]}ə	→	{[(bát)]}(ə)	→	{[(bát)](ə)}	→	{[(bát)(ə)]}

- For any of these strings to occur in a derivation, they must be harmonically improving
- I'm employing gradual syllabification here, following Pater (to appear), Elfner (2009). For an argument for free syllabification see McCarthy (2010) [2]

[2]If free syllabification is allowed, the conclusions presented here do not change, as long as parsing into higher prosodic structure is a separate step from epenthesis + syllabification

7. Epenthesis for prosodic markedness is not harmonically improving

Lapse

- In order for epenthesis to resolve a violation of *Lapse, an input must go through the following derivational stages:

(24) Required derivational Stages

	⋮
(foot-building operations)	[(bák)(du)](pi)[(kíb)(ti)]
1. Epenthesis	[(bák)(du)](pi)ə[(kíb)(ti)]
2. Syllabification	[(bák)(du)](pi)(ə)[(kíb)(ti)]
3. Foot building	[(bák)(du)][(pí)(ə)][(kíb)(ti)]

- Epenthesis is not harmonically improving.
- Epenthesis at the second step is harmonically bounded - it does nothing to resolve the *Lapse violation, and incurs an additional violation of Dep.

(25) *Lapse ≫ Dep

	[(bák)(du)](pi)[(kíb)(ti)]	*Lapse	Dep
→ a.	[(bák)(du)](pi)[(kíb)(ti)]	1	
b.	[(bák)(du)](pi)ə[(kíb)(ti)]	2W	1W

- Candidate b. is harmonically bounded by candidate a., and the derivation converges here.
- The form [(bák)(du)][(pí)(ə)][(kíb)(ti)], with the epenthesized material parsed into a foot, is more harmonic given the constraint set than any of the others.
- But because it is not in the candidate set at the first stage, Eval cannot choose it.
- This form will never make it into the candidate set.

NonFinality

- The same story can be told for violations of NONFINALITY

(26) Required derivational Stages

	⋮
(foot-building operations)	{[(bák)]}
1. EPENTHESIS	{[(bák)]}ə
2. Syllabification	{[(bák)]}(ə)
3. Parsing	{[(bák)](ə)}

- Epenthesis is once again not harmonically improving
- The form {[(bák)](ə)} avoids the violation of NONFINALITY, but it is inaccessible because the epenthesis is harmonically bounded.

FtBin

- In order for epenthesis to resolve a violation of FTBIN, an input must go through the following derivational steps:

(27) Required derivational Stages

	⋮
(foot-building operations)	[(bák)]
1. EPENTHESIS	[(bák)]ə
2. Syllabification	[(bák)](ə)
3. Parsing	[(bák)(ə)]

- Once again, epenthesis at the second step is harmonically bounded - it doesn't relieve the FTBIN violation, and incurs a gratuitous violation of DEP

5 Getting attested epenthesis in HS

8. Epenthesis for syllabic markedness

   - I've argued that segments can't be epenthesized and simultaneously parsed into any prosodic structure above the level of the syllable
   - Elfner (2009) argues that segments can be epenthesized into an existing syllable
   - Thus, segmental epenthesis can be used to repair bad syllable structure
   - Here is an example of epenthesis to repair a violation of ONSET: (following Elfner, 2009)

(28) ONSET ≫ DEP

	{[(át)(ka)]}	ONSET	DEP	
→ a.	{[(ʔát)(ka)]}		1	*epenthesis of [ʔ]*
b.	{[(át)(ka)]}	1W	L	*No change*

9. Segmental markedness

   - As demonstrated in (21) above, segmental markedness can be resolved by epenthesis in a single step, as it doesn't depend on the prosodic status of the epenthetic segment.

10. Word-Minimality

    - Word-subminimality is the only kind of prosodic markedness that appears to be resolved by epenthesis
    - Garrett (1999); Piggott (1993, 2010) argue that minimal word size is unconnected to minimal foot size - thus epenthesis for word-subminimality is not epenthesis for foot-subminimality
    - I'll argue here that this is actually *morpheme* epenthesis rather than segment epenthesis
    - What is epenthesized to repair subminimal words is frequently different from what is epenthesized to resolve other kinds of markedness in the language

(29) Mohawk epenthesis:
for consonant clusters:/karatʔ/ → [karate**e**ʔ]
for word-minimality: /keks/ → [**i**keks]

(30) Swahili epenthesis:
for consonant clusters: /ratli/ → [rat**í**li]
for word-minimality: /la/ → [**kú**la]

- The epenthesized material looks like a null morpheme in many cases
  - In Swahili, [ku] is actually the infinitve morpheme, but it's semantically vacuous when it's used to resolve word-minimality
  - In Navajo, [yi-] is epenthesized to fix subminimal words. This has been argued to be a null morpheme (Young Morgan, 1987)
  - Perhaps other cases of epenthesis for word-minimality are amenable to similar construals.
- The proposal: morpheme epenthesis
  - Wolf (2008) describes a process of epenthesis in Pitjantjatjara: [pa] is epenthesized whenever a word would otherwise end in a consonant
  - He argues that this is epenthesis of a null morpheme
    - Epenthesis of a vowel should be sufficient to solve the problem; epenthesizing the [p] is superfluous
    - [p] is otherwise typologically unattested as an epenthetic segment
  - Thus null-morpheme epenthesis is an operation in Gen
  - Subject to different requirements than segmental epenthesis

6 Local Summary

- I've proposed a restriction on Gen
  - Epenthesis and parsing into prosodic structure are two separate steps
- Given this restriction, outputs where epenthesis is used to avoid a violation of a metrical markedness constraint are inaccessible because there is no *harmonically improving* derivational path to them

- Attested types of (segmental) epenthesis are cases where epenthesis can resolve a violation of some syllabic or segmental markedness constraint in a single derivational step

7 Future work

11. The problem of *Clash

    - A violation of *Clash can be repaired with the following steps:

    (31) Required derivational stages

	⋮
(foot-building operations)	[(ba)(dúk)][(pít)(ki)]
1. Epenthesis	[(ba)(dúk)]ə[(pít)(ki)]
2. Syllabification	[(ba)(dúk)](ə)[(pít)(ki)]

    - Unlike in the previous examples, epenthesis is a harmonically improving step here.
    - The *Clash violation is repaired in a single step - even though the epenthesized segment isn't parsed into anything, it resolves the *Clash violation because it separates the adjacent stressed sylables.

    (32) *Clash ≫ Dep

	[(ba)(dúk)][(pít)(ki)]	*Clash	Dep
→ a.	[(ba)(dúk)]**textschwa**[(pít)(ki)]		1
b.	[(ba)(dúk)][(pít)(ki)]	1W	L

12. A possible solution:

    - A Clash is defined as two *adjacent* stressed syllables
    - What does it mean for syllables to be adjacent?
    - If an intervening unparsed segment does not render two stressed syllables non-adjacent, then epenthesis cannot resolve a stress clash in a single step.
    - In terms of the metrical grid, an unsyllabified segment does not project any grid mark.

(33) A stress clash in grid terms:

	x	x		
x	x	x		x
σ	σ	σ		σ

(34) The same grid with an unsyllabified epenthetic segment:

	x			x	
x	x			x	x
σ	σ	ə	σ	σ	

- If the metrical grid, and not the segmental material, is the domain over which adjacency is assessed, then epenthesis does not resolve a violation of *Clash in a single step.

13. Morpheme Epenthesis

- How is it that epenthesis of a morpheme can fix prosodic word subminimality in a single step?
- There probably needs to be some kind of lookahead, such that the derivation 'knows' what shape the null morpheme is before it's epenthesized
- It might even have to come with some prosodic structure if it's to satisfy the word minimality requirement.

8 Conclusion

- Using the derivational framework of Harmonic Serialism, with the additional restriction that epenthesis and parsing into prosodic structure are two separate steps, I've ruled out epenthesis as a possible repair for stress lapse, nonfinality and foot-subminimality
- In a derivational system like HS, some forms may be more harmonic than their corresponding input form, or than other potential output forms, but because there is no legal derivational path to them, they cannot be legal outputs.
- Thinking derivationally can lead to solutions for too-many-repairs problems like this one

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