Positional Faithfulness, Non-locality, and the Harmonic Serialism Solution

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1. The Problem with Positional Faithfulness in Parallel OT

Positional Faithfulness constraints (Beckman 1997, 1998) assign violation marks when a segment in a privileged output position is unfaithful relative to its input correspondent.

- These constraints are vacuously satisfied when the positional condition is not met (i.e., when a segment is not in the privileged output position – onset in (1) below).

\[
\begin{array}{c|c|c|c|c}
/pada/ & \text{IDENT}[^\text{voice}] / \text{ONSET} & \text{IDENT}[^\text{voice}] & * & *
\hline
\text{[pa:da]} & * & * & & \\
\text{[pa:ta]} & & & \checkmark \text{(vacuously)} & *
\end{array}
\]

[Throughout, shaded segments occupy privileged positions for the purpose of assessing positional faithfulness constraints.]

- Candidates in parallel OT vary freely across all dimensions – including prosodic structure (McCarthy & Prince 1993).

- Competing candidates can differ in whether or not they violate the positional faithfulness constraint.

Consequence: Candidates with marked prosodic structure can prove optimal when this allows both a markedness constraint and a conflicting positional faithfulness constraint to be (vacuously) satisfied. The resulting patterns are opaque and can be highly non-local.

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These pathological patterns emerge when the ranking in (2) holds.

(2) Ranking responsible for pathological positional-faithfulness effects:

\[
\text{POSITIONAL\ FAITH} \gg \text{MARKEDNESS} \gg \text{GENERAL\ FAITH, STRUCTURAL CONSTRAINTS}
\]

[Structural constraints = constraints responsible for language – specific patterns of syllabification, footing, segment preservation, etc.]

1.1 Example Problem 1: Syllabification

‘Normal’ positional faithfulness effects stem from rankings like that in (3) – example based on Beckman (1998:37fn), see also McCarthy (2007).

\[
\begin{array}{c|c|c|c|c|c|c|c}
/\text{pada}/ & \text{IDENT}[^\text{voice}] / \text{ONSET} & \text{*Voiced\ Obstruent} & \text{IDENT}[^\text{voice}] & * & *
\hline
\text{[pa:da]} & * & * & & \\
\text{[pa:ta]} & & & ! & *
\end{array}
\]

... but not in coda

\[
\begin{array}{c|c|c|c|c|c|c|c}
/\text{panad}/ & \text{IDENT}[^\text{voice}] / \text{ONSET} & \text{*Voiced\ Obstruent} & \text{IDENT}[^\text{voice}] & * & *
\hline
\text{[pa:na]} & * & ! & & \\
\text{[pa:nat]} & & ! & & *
\end{array}
\]

Such neutralization patterns require that the constraints responsible for placing particular segments in the position targeted by a positional faithfulness constraint dominate that positional faithfulness constraint – counter (2).

- In (3), the constraints responsible for syllabification (e.g., ONSET) must dominate the positional faithfulness constraint IDENT[^voice]/ONSET and the conflicting markedness constraint *VoicedObstruent.

\[
\begin{array}{c|c|c|c|c|c|c|c}
\text{With a [-voice] input consonant, onset syllabification}
/\text{pada}/ & \text{IDENT}[^\text{voice}] / \text{ONSET} & \text{*Voiced\ Obstruent} & \text{IDENT}[^\text{voice}] & \text{ONSET}
\hline
\text{[pa:da]} & * & ! & * & *
\text{[pa:ta]} & ! & * & * & *
\end{array}
\]

\[
\begin{array}{c|c|c|c|c|c|c|c}
\text{With a [-voice] input consonant, devoicing and coda syllabification}
/\text{pada}/ & \text{IDENT}[^\text{voice}] / \text{ONSET} & \text{*Voiced\ Obstruent} & \text{IDENT}[^\text{voice}] & \text{ONSET}
\hline
\text{[pa:da]} & * & ! & * & *
\text{[pa:ta]} & ! & * & * & *
\text{[pa:nat]} & & ! & ! & *
\end{array}
\]

Parsing input /pada/ as [pa:ta] allows *VoicedObstruent to be satisfied without incurring a violation of IDENT[^voice]/ONSET – IDENT[^voice]/ONSET is vacuously satisfied.

The underlying featural contrast is opaque displaced onto the output prosodic structure.
(5) **Chain shift pattern:** \( \text{pa.da} \rightarrow \text{pat.a} \); \( \text{pat.a} \rightarrow \text{pa.ta} \)

[The pattern is opaque regardless of input syllabification]

cf. Blumenfeld 2006 – positional markedness constraints can also cause marked prosodic structures to emerge, but the resulting patterns are surface true – not opaque.

Importantly, coda syllabification is adopted just when it allows for better satisfaction of the positional faithfulness and conflicting markedness constraints. Surface [+voice] can sometimes be optimal in a language with the ranking in (4).

- If coda syllabification is blocked (e.g., by high-ranking *\text{COMPLEXCODA}), segment(s) surface in onset with faithful voicing specifications – /pa zab\(a\) / \(\rightarrow\) [pa ba]

**Result:** A language with contrastive voicing in medial onsets just when there is a preceding voiceless consonant in coda position.

### 1.2 Example Problem 2: Footing

A further example involving IDENT[±ATR]/σ and *[-ATR].

- The language has default trochaic stress (due to the TROCHEE >> IAMBJ ranking)
- However, with these foot-structure constraints ranked beneath IDENT[±ATR]/σ and *[-ATR], trochaic stress is not consistently preferred.

(6) **With the second input vowel [-ATR], no output [-ATR] contrast and a trochaic parse**

<table>
<thead>
<tr>
<th>/\text{bd}\text{g}1/</th>
<th>IDENT[±ATR]/σ</th>
<th>*[-ATR]</th>
<th>IDENT[±ATR]</th>
<th>TROCHEE</th>
<th>IAMBJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\text{b.d}g)</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>(\text{b}g\text{d})</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**With the initial input vowel [-ATR], no output [-ATR] contrast and a iambic parse**

<table>
<thead>
<tr>
<th>/\text{b}\text{d}\text{g}1/</th>
<th>IDENT[±ATR]/σ</th>
<th>*[-ATR]</th>
<th>IDENT[±ATR]</th>
<th>TROCHEE</th>
<th>IAMBJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\text{b}\text{d}g)</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\text{b.g}d)</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When the initial input vowel is [-ATR], iambic parsing allows for satisfaction of both IDENT[±ATR]/σ and *[-ATR].

**But:** iambic parsing is optimal only when it provides a global benefit.

- If both input vowels are [-ATR] there is no way to avoid violation of IDENT[±ATR]/σ.

### 2. Resolving the Problem through Harmonic Serialism

Pathological patterns arise in parallel OT because not all candidates privilege the same (or any) elements.

- This problem could be avoided if positions were defined against the input, but then positional faithfulness constraints could only refer to structures present at that level (see §3 for related discussion).


- Candidates are derived through a series of harmonically improving steps (i.e., steps where each successive form is better formed than the last, according the language-specific constraint hierarchy).

**Proposal:** The most recent step in the derivation defines privileged positions, and is the basis for assessing faithfulness violations.

**Result:** Positional faithfulness constraints cannot be vacuously satisfied.

<table>
<thead>
<tr>
<th>/\text{pa}.\text{d}a/</th>
<th>IDENT[±ATR]/σ</th>
<th>IDENT[±ATR]</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\rightarrow) [\text{pa}.\text{d}a]</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

When alternating stress is enforced due to high-ranking *\text{CLASH} / *\text{LAPSE}, the non-local nature of the system becomes clear:

- Iambs are preferred when there are more [-ATR] vowels in odd-parity syllables than in even-parity syllables: /\text{b}\text{d}\text{b}\text{d}\text{i} / \rightarrow [(\text{b}d)(\text{di})]; /\text{b}\text{d}\text{b}\text{d}\text{b} / \rightarrow [(\text{b}d)(\text{di})\text{b}(\text{de})]
- Otherwise, trochees are preferred: /\text{b}\text{d}\text{i}\text{b}\text{d}\text{g} / \rightarrow [(\text{b}d)(\text{bi}d)]; /\text{b}\text{d}\text{b}\text{i}\text{d} / \rightarrow [(\text{b}d)(\text{de})\text{b}(\text{de})]
- This is a majority rules pattern.

**Result:** A language with output [-ATR] vowels allowed in the heads of feet only when (more) input [-ATR] vowels map unfaithfully in dependent syllables.
• **Result:** Positions of privilege are constant across candidates; the pathologies found in parallel OT are excluded.

### 2.1 Resolving Example 1: Syllabification

Rankings like that in (9) are unproblematic in Harmonic Serialism – cf. (4).

(9) \( \text{IDENT}[\text{voice}]/\text{ONSET} >> *\text{VOICE}\text{OBSTRUENT} >> \text{IDENT}[\text{voice}] \), ONSET

Once the intervocalic segment is syllabified as an onset, that onset position identifies it as **privileged for the next step** in the derivation.

\[
\begin{array}{|c|c|c|c|c|}
\hline
\text{IDENT}[\text{voice}]/\text{ONSET} & *\text{VOICE}\text{OBSTRUENT} & \text{IDENT}[\text{voice}] & \text{ONSET} \\
\hline
\text{pa.ta} & \text{IDENT}[\text{voice}] & * & \\
\hline
\text{pat.a} & \text{IDENT}[\text{voice}] & * & \\
\hline
\text{pa.ta} & \text{IDENT}[\text{voice}] & * & \\
\hline
\text{pat.a} & \text{IDENT}[\text{voice}] & * & \\
\hline
\end{array}
\]

Output: [pa.ta] Winning derivation: <pa.ta, pa.ta>

Devoicing the [d] in [pa.da] is **not harmonically improving**: it is protected by high-ranking IDENT[voice]/ONSET even if it is simultaneously resyllabified as a coda.

There is **no opacity** here; the underlying voicing specification of segments cannot affect syllabification.

- A [+voice] input segment syllabified as an onset is realized faithfully.
- A [+voice] input segment syllabified as a coda (due, e.g., to the Weight-to-Stress principle) is devoiced.

The pattern is **surface true**: a [voice] contrast is only possible in onset position.

### 2.2 Resolving Example 2: Footing

The footing problem is resolved in the same fashion.

(11) \( \text{IDENT}[\text{ATR}]/\sigma >> *\text{[-ATR]} >> \text{IDENT}[\text{ATR}] \), TROCHEE >> IAMB

Once the stress pattern is established, the stressed syllable is **privileged for the next step** in the derivation.

- Tensing the [g] in (\text{bg}.di) is **not harmonically improving**: it is protected by high-ranking IDENT[\text{ATR}]/\sigma even if the footing is simultaneously altered.

There can be **no majority rules or non-local effects** here; decisions about footing are not affected by the underlying \([\text{ATR}]\) specification of segments.

### 3. Further Discussion

The examples presented here are not unique. It is possible to invent many other similar cases:

- Stress shift to allow the surface stressed syllable to preserve its underlying value for [nasal] in a harmony system (Wilson 2004)
- Truncation of any number of initial voiced obstruents to allow joint satisfaction of IDENT[\text{voice}]/\text{INITIAL} and *\text{VOICE}\text{OBSTRUENT}, etc.

The ranking schema in (2) consistently gives rise to pathologies in parallel OT. Harmonic Serialism avoids these by allowing us to define positions of privilege based on the immediate input to a given step in the derivation.
Some remaining issues:

Ordering of prosodification and featural changes: §2 assumed that prosodification (e.g., footing and syllabification) takes place before any featural operations (see also McCarthy 2007 and Sprouse 1997).

- If featural changes must occur first for some reason, however, still no pathology results. Instead, the language simply has no instances of the marked feature, including in privileged positions.

(13) Example derivation – featural changes before prosodification

Step 1: /pada/ → pata devoicing due to + voiced ◄ IDENT[+voice]

(IDENT[+voice]/ONSET cannot influence this step because no segments in the input to this step are in onset position).

Step 2: pata → [pa.ta] optimal syllabification given ONSET, NOCODA, etc.

- A positional faithfulness constraint can only be assessed once the prosodic structure needed to define the privileged position has been assigned.

Ultimate input vs. the most recent derivational step: Faithfulness violations here are assigned based on the input to the current step in the derivation (see, e.g., the final step in the first derivation in (12)).

- This ensures that “new” violations of positional faithfulness constraints cannot be assessed after the initial featurally-unfaithful operation. Otherwise, (re)prosodification could be blocked, or the pathologies discussed in §1 reintroduced.

- Defining positions against the immediate input rather than against the ultimate input or an initial fully-faithful parse (cf. McCarthy 2007) allows us to model transparent patterns of positional neutralization even if, e.g., the syllabification changes during the course of the derivation (due to syncope, perhaps).

- Sum: Assessing faithfulness violations based on the most recent step in the derivation ensures that attested surface-true, non-opaque patterns can be modeled using positional faithfulness constraints, while excluding the pathologies found in parallel OT.

4. References


Kimper, Wendell. 2008. Local optionality and Harmonic Serialism. Ms., University of Massachusetts Amherst. [ROA-988]


