BUILDING PARALLEL STRUCTURES

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I. *Contrast and representations: Two views*

The Successive Division Algorithm (Dresher 2009):

- The input to the SDA is an inventory *I* of one or more segments that are not yet featurally distinct from one another.
- If *I* contains more than one phoneme, it is divided into two (non-null) subsets: *M*, marked with a feature *F*, and its unmarked complement $\bar{M}$.
- *M* and $\bar{M}$ are each taken as input to the same procedure. The process continues recursively until all segments have been distinguished, which is trivially the case when *I* contains only one phoneme.

Features form a contrastive hierarchy, with those used in earlier divisions taking scope over those used later:

Figure 1 : A contrastive hierarchy with *F* > *G*

If feature *F* takes scope over feature *G*, then the presence of a segment *x* specified [*F*, *G*] entails…

- …that there is a segment *y* with only [*F*],
- …and there is a segment *z* with no features.

(There may or may not be a segment with only [*G*].)

The Parallel Structures Model (Morén 2003 *et seq.*):

The PSM is primarily a theory of feature geometry, but it also has something to say about contrast and complexity.

- For every feature used in a given system, there is one segment specified only with that feature.
- This principle is similar to the Autonomous Interpretation Hypothesis in Element Theory (Harris & Lindsey 1995).

Figure 2 : Features *F* and *G* in a semilattice

There are no scope relations between features here, but the presence of a segment *x* specified [*F*, *G*] entails…

- …that there is a segment *y* with only [*F*],
- …and there is a segment *w* with only [*G*].

(There is no fully unmarked segment.)

What the two theories have in common: Complex representations exist only when they contrast with simpler ones.

II. *An algorithm for the PSM*

Could we define a procedure like the SDA that would assign feature specifications compatible with the PSM?

- This might make it easier to draw comparisons between the two theories.
- It might also make interesting predictions about acquisition.

The PSM does not naturally lend itself to an algorithm that divides an inventory into subsets—i.e., into natural classes. The requirement that every feature must appear by itself means that PSM representations normally will not fully reflect class membership: when *n* features are used to specify an inventory (of up to 2^n–1 segments), there will be *n* segments that have only one feature, and that thus are marked as belonging to only one class.

Instead, the algorithm could proceed by addition and recombination:

> **Building Parallel Structures, version 1**
>
> 1. Start with no segments, and no features.
> 2. To add a segment to the inventory, do either of the following:
>
> 2.1 Create a new primitive segment by introducing a new feature *F* (or by placing an existing feature *F* under a different node), *or*
>
> 2.2 Create a new complex segment by combining the features of any existing segment with the sole feature *F* of any existing primitive segment.

By the way: We can encode Feature Economy (Clements 2003) as a preference for step 2.2 over step 2.1.

This version of the algorithm makes the expansion of the inventory into complex segments incremental. Before adding a segment with the features [*F*, *G*, *H*], the inventory must already have not only [*F*], [*G*], and [*H*] on their own, but also at least one of [*F*, *G*], [*F*, *H*], or [*G*, *H*].

III. *Conditions on complexity*

Version 1 is consistent with PSM practice, but more or less restrictive versions also deserve exploration. Step 2.2 can be altered in such a way as to impose minimal restrictions on featurally complex segments:

> **Building Parallel Structures, version 2**
>
> 2.2 Create a new complex segment by combining the features of any number of existing (primitive) segments.

In version 2, a segment with multiple features entails the corresponding set of primitive segments, but does not require any intermediately complex segments. (Economy might account for the rarity of large jumps in complexity.)

A maximally restrictive alternative:

> **Building Parallel Structures, version 3**
>
> 2.2 Create a new complex segment with *n* features, using the union of the features of *n* existing segments with *n* – 1 features each. (2 ≤ *n* ≤ total number of features currently in the system)

Version 3 imposes a restriction stated by Harley & Ritter (2002: 509) for morphosyntactic features:

> *[W]e expect that if a language has a pronoun with a complex geometry, the simpler geometries that form the subconstituents of the complex geometry are also available in the language.*

OT also favours this version: Morén (2006: 337–338) notes the difficulty of creating a constraint ranking that allows surface segment [*F*, *G*, *H*] while disallowing [*F*, *H*].

Version 3 is not wholly consistent with PSM practice. In the Hawaiian inventory in Figure 3, /m/ would imply a segment with C-Manner: Open and C-Place: Labial (perhaps /ɱ/), and /o/ would imply a segment with V-Manner: Open and C-Place: Labial (perhaps /ɔ/). Or we could consider whether these representations are appropriate for /m/ and /o/ themselves.

Figure 3 : Hawaiian segments as a semilattice (specifications from Morén 2006)

IV. *Implications in acquisition*

If we treat the algorithm (in any of these three versions) as an acquisition procedure, then the partial ordering of segments that is already implicit in their representations becomes temporally concrete.

- We expect complex segments to be acquired after the simpler segments whose representations they subsume.
- The fact that the ordering is partial leaves some room for individual variation.
- Any phonological analysis that uses the PSM can make predictions about the order in which children will acquire the segments in the inventory.
- Conversely, observed sequences of segmental acquisition can make predictions about representations.

Like the constraint-based neo-Jakobsonian approach of Levelt & van Oostendorp (2007) and van 't Veer (2009), this view of acquisition emphasizes the sequence of segments that make up the inventory. Much as the representations in Figure 3 imply a partial ordering of the segments of Hawaiian, van 't Veer (2009) uses constraints to derive the partial ordering of Québécois French consonants in Figure 4 (attested as the sequence of onsets acquired by a child named Clara):

p > d > b, k > l, t > m > n, g > v > s, f > š > r, z > ž

Figure 4 : Clara's onsets (van 't Veer 2009)

The SDA, on the other hand, emphasizes the sequence of contrasts. At each non-final step, the child's inventory contains some underspecified archiphoneme-like representations that will later diverge into distinct segments. To compare the SDA with the PSM algorithm empirically, we need a theory of how children pronounce archiphonemes. The expectation common to both approaches, though, is that more complex structures are built as they become necessary to distinguish larger numbers of segments.

V. *References*

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