On McCarthy's (1988) "Feature Geometry and Dependency: A Review"

Abstract

This review article discusses features. It argues for arranging features into a hierarchy and then decides upon a particular structure using predictions made by unrestricted application of the basic operations of spreading and delinking, along with application of the OCP. Discussion arises on the difference between the phonetic and the phonological, with seemingly natural phonetic classes being discarded if there is no phonological motivation.

1 Features Without Geometry

Early featural systems just had unstructured bundles:

$$\begin{bmatrix} \mathbf{t} \\ -\text{son} \\ +\text{cons} \\ -\text{syll} \\ +\text{cor} \\ +\text{ant} \\ -\text{high} \\ -\text{low} \\ -\text{back} \\ -\text{cont} \\ -\text{nas} \\ -\text{lat} \\ \text{etc.} \end{bmatrix} \quad \begin{bmatrix} \mathbf{i} \\ +\text{son} \\ -\text{cons} \\ +\text{syll} \\ -\text{cor} \\ -\text{ant} \\ +\text{high} \\ -\text{low} \\ -\text{back} \\ +\text{cont} \\ -\text{nas} \\ -\text{lat} \\ \text{etc.} \end{bmatrix}$$

There is a simple account for place assimilation in such a system:

$$[+\text{nas}] \rightarrow \begin{bmatrix} \alpha\text{cor} \\ \beta\text{ant} \\ \gamma\text{back} \end{bmatrix} / \underline{\quad} \begin{bmatrix} \alpha\text{cor} \\ \beta\text{ant} \\ \gamma\text{back} \end{bmatrix}$$

But it overpredicts:

$$[+\text{nas}] \rightarrow \begin{bmatrix} \alpha\text{back} \\ \beta\text{cor} \\ \gamma\text{ant} \end{bmatrix} / \underline{\quad} \begin{bmatrix} \alpha\text{cor} \\ \beta\text{ant} \\ \gamma\text{back} \end{bmatrix}$$

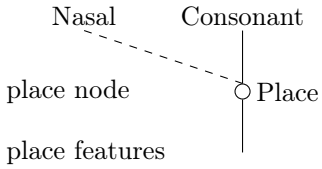
The mechanism for assimilation can be abused for rather arbitrary transformations.

An analysis based around feature geometry and nonlinear phonology provides a more principled way to approach these things, describing attested assimilation patterns easily while making these unnatural patterns difficult or impossible to describe.

2 Phonological Rules

Nonlinear phonology supposes that features exist on their own tiers. They are linked to segments by association lines. A hierarchical feature geometry gives each node its own tier.

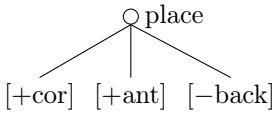
Assimilation is via spreading, adding an association line to attach an existing node to another segment.



This is governed by a rule that prohibits the crossing of association lines. Prohibiting crossed lines ensures that spreading cannot proceed beyond a segment specified for the features in question.

The other operation is delinking. A common transformation s → h is just delinking of the place node:

$$\begin{bmatrix} -\text{voice} \\ +\text{cont} \end{bmatrix}$$



The Obligatory Contour Principle (OCP) prohibits two identical adjacent features. It doesn't apply everywhere, but features and nodes can be evidenced by its application.

One proposal includes a root node dominating a laryngeal and supralaryngeal node. The latter has as children both manner and place. McCarthy argues against such a structure, so I'm not drawing it here.

3 No Manner

While some individual manner features assimilate, spreading of an entire manner node seems to be unattested. Delinking is a reduction to the unmarked, and while the oral stop is considered the least marked consonant type, no language reduces all consonants to oral stops. Further, no OCP-based dissimilation in manner has been observed.

Because none of the processes that should be able to affect nodes seem to deal with an overarching manner node, the logical conclusion is that such a node cannot exist.

4 No Supralaryngeal

When place is a subfeature of supralaryngeal, the following processes are accounted for. Spreading of the place node is place assimilation. Debuccalization is delinking of the supralaryngeal node. The place node encounters OCP effects. But OCP on the supralaryngeal node, spreading that node, and delinking the place node are all unattested. Each undergoes some of the expected processes, and indeed they are in complementary distribution.

McCarthy argues that debuccalization could equally well be considered as delinking of the place node, as continuancy and nasality cannot be contrastive on glottals. Then the supralaryngeal node itself can be removed and its other children attached directly to its parent, the root node.

Accounting for these changes results in a root node immediately dominating six other nodes: a laryngeal node, a place node, as well as the continuancy, nasality, sonorance, and laterality features.

5 Geometry vs Nonbinarity

There is theoretically no real difference between a place node which has one of several possible children and a single n-ary feature. The only argument against the n-ary feature is a cooccurrence restriction in Arabic, where two labials may not occur within the same triconsonantal root. Hinging on locality, this argument essentially says that distinct values for the feature should not be able to be transparent to one another. We might discuss whether this distinction is meaningful now that we know that strictly piecewise constraints exist.

Later on, further aspects of the geometry lend more credence to the separate features anyway. Examples include roundness being a subfeature of labial, or the tongue gesture features distributed, anterior, and lateral being subfeatures of coronal.

6 What is Place?

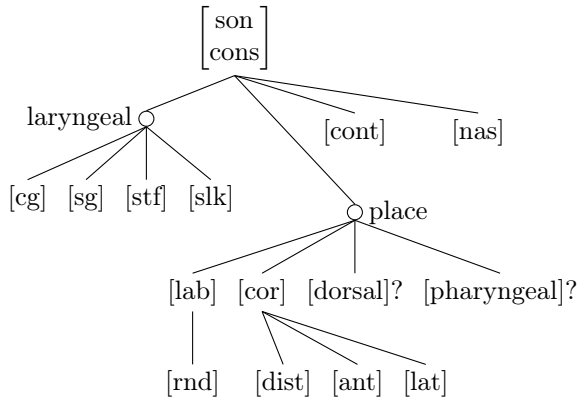
A POA analysis suggests two features for place: anteriority, with anything forward of the palatoalveolar region being [+ant] and anything else being [−ant], and a coronal feature, positive for things produced with the tip or blade of the tongue and negative for others.

In contrast, an articulatory analysis uses three features: labial, coronal, and dorsal. These represent active articulators involved, those being the lips, tongue tip or blade, or tongue body, respectively. McCarthy argues that such an analysis is better than the POA hypothesis because the crucial [±ant] feature is arbitrary, corresponding neither to a distinctive articulatory gesture nor to a distinctive acoustic result.

In the articulatory system, complex segments are represented by linking multiple articulators to the same place node. If both labial and dorsal features are linked, this might represent a p͡k segment. There is no inherent ordering between the features, so it may equally well represent k͡p. But what of w? (Answer: it's considered only dorsal.)

7 Conclusions and Discussion

A phonologically-motivated feature geometry:



This arrangement accounts for phenomena that operate by spreading or delinking of nodes within the hierarchy. The features beneath laryngeal there are: constricted glottis, spread glottis, stiff vocal cords, and slack vocal cords.

We might question how such an analysis accounts for other types of phenomena. For example, Latin liquid dissimilation has "l" and "r" alternate on their tier, except noncoronal consonants are opaque to the pattern. This would essentially be an OCP effect, but the tier over which it is specified seems to be somewhat unnatural.

Moreover, what is the status of a natural class in this system? Is it all and only those things that can be described by a portion of the tree representing the hierarchy?