

FEATURE GEOMETRY: EXPLOITING THE FEATURE TREE**1. INTRODUCTION**

- the role of phonological vs. phonetic considerations -- two extreme views
 - a. phonology is concerned with patterns and categories that are *unconstrained by phonetics*
 - b. phonetics is concerned with discovering *systematic articulatory and acoustic differences in the realization of members of the same phonological categories*

Generative phonology:

**BOTH PHONOLOGICAL AND PHONETIC CONSIDERATIONS
ARE IMPORTANT!**

- a. the gestures of speech reflect abstract linguistic categories and can be expected to differ from identical physical movements that do not realize linguistic categories;
- b. the phonological categories are constrained by the vocal tract and the human auditory system.

Finding the *proper balance* between these phonological and phonetic considerations is a *central question of linguistic theory*.

- There are two general approaches to phonological features:
 - a. features are realizing a certain *action* or movement
 - b. features are *static targets or regions* of the vocal tract (this is the view that is embodied in the IPA).

Study (1) on p. 137:

These categories are capable of distinguishing one sound from another on a systematic basis.

However: if phonetics represent the physical realization of abstract linguistic categories, then there is a good reason to believe that *a much simpler system underlies the notion “place of articulation.”*

By concentrating on articulatory accuracy, we are in danger of losing sight of the phonological forest among the phonetic trees.

Example: [v] patterns phonologically with the bilabials rather than with the dentals (p. 137).

The various places of articulation are not *phonologically equidistant*!

Examples:

- only few languages have *bilabial vs. labiodental* contrasts, while many languages have *labiodental vs. dental* contrast
- sounds combining *bilabial and velar articulation* are common [k͡p], but there are no sounds that combine simultaneously *bilabial and labiodental* articulators

The IPA system describes vowels with a system of articulatory targets that *differs radically* from the one employed for consonants: the highest point of the tongue arch.

Problems:

- a. the description of the actual location of the tongue is not accurate (such as the description of [ɪ] and [e] -- the highest point for the tongue arch is lower for the [ɪ]. However, we must group [i] and [ɪ] together as a natural class -- e.g. Canadian French affricates [t͡ʃ] before [i] and [ɪ] but not before [e].
- b. the IPA fails to provide a *uniform set of categories* to describe both consonants and vowels -- we do not have two mouths (one for consonants and one for vowels), and many phonological processes cut across the consonant-vowel division.

Halle's model (1983): the features are viewed as *neural commands to activate certain articulators* with specific muscular gestures.

The process of speech production consists in moving an articulator from one position to another!

Halle: Features are abstract neural categories with specific articulatory and acoustic correlates.

Study the examples on p. 138: evidence for the lack of a one-to-one relation between a given feature's acoustic and articulatory correlates.

- [k] -- two acoustic cues; one may be missing (e.g. *asks* vs. *asps* are distinguished only on the basis of one acoustic cue!)
- voicelessness -- two different articulatory correlates (stiffening or spreading the vocal folds)!

Phonological rules never distinguish a sound depending on its associated phonetic correlate -- they equate the two, operating at an abstract level!

Sapir's example: Explain (p. 139)

The same physical hardware can be operated by distinct neural (software) systems -- *linguists are interested in the neural system that activates the vocal apparatus to produce speech.*

- The ARTICULATORY MODEL is premised on a close relationship between phonetics and phonology:

it postulates a set of six articulators with special formal properties



The articulators and the features they execute: (2) on p. 145.

- a. both consonants and vowels are described with the same set of articulators
 - b. both [p] and [f] are implemented with the Labial articulator (this explains their affinities even though the point of stricture may vary).
- In the ARTICULATORY MODEL, the features are claimed to control specific muscular activations.
 - This view contrasts with the more traditional one, which sees place of articulation as a division of the vocal tract into regions without considering the articulators that are activated in each region.

2. THE FEATURE TREE

Generative model: the features have been represented as an unorganized bundle: the features may freely combine in the construction of a phonemic inventory as well as in defining natural classes.

This is wrong -- two reasons:

- a. some features are best thought of as introducing a subdistinction within the category defined by another feature: e.g., [distributed] and [anterior] relevant only to coronals.
[-distributed] [t] does not pattern with [-distributed] [h] despite the prediction implied! (p. 146)
- b. certain features form recurrent groupings in phonological rules and constraints (e.g., vowel assimilation rules, read the example on p. 146).

Study (3) on p. 146.

In this model hierarchical distinctions are introduced among the features.

Any member of the UG phonetic alphabet can be generated by choosing the appropriated articulator and dependent feature(s), the cavity in which the articulator forms a stricture, and general characteristics of the degree and type of stricture, which leads to the segment identity as an obstruent, sonorant consonant or vowel (p. 147).

[distributed] is relevant only to coronals: how does the tree express this relevancy? (p. 147)

recurrent feature groupings: how does the hierarchical tree provide a formalism for this? (p. 147)

Depending on the root, there are two types of features:

- a. articulator-bound features -- those that can be localized to a particular articulator;
- b. stricture features -- [continuant], [strident], [lateral] --- these combine more freely.

Combination of features:

Vowels:

[-consonantal, +sonorant]

Sonorant consonants:

[+consonantal, +sonorant]

Obstruents:

[+consonantal, -sonorant]

Constraint: [+consonantal] dominates the Oral cavity (Labial, Coronal and Dorsal articulators only) → implication: pharyngeals and laryngeals will pattern as [-consonantal] glides -- a valid prediction!

(p. 147)

Feature trees generated for selected segments -- study (4) on p. 148.

Any given terminal feature implies the presence of the corresponding articulator and all higher nodes.

The major articulator is indicated with an asterisk: * see (5) on p. 149.

The essential property of the tree graph is the relation of *dependency* and/or *dominance*.

Any non-terminal node in the graph forms the root of a subtree composed of all the nodes it dominates.

Example: Coronal groups [anterior] and [distributed]; Oral groups Labial, Coronal, and Dorsal, and therefore also groups the Coronal dependents [anterior] and [distributed].

No significance is attached to the order of the branches (e.g., to whether Oral precedes or follows Pharyngeal at the cavity level, or whether Labial precedes or follows Dorsal at the articulator level).

It is the presence or the absence of features and their hierarchical arrangement that is important.

3. ASSIMILATION

The feature tree provides a natural representation of assimilation by establishing a new connection (= *association*) between two nodes.

Assimilation is represented by a dotted line connecting the features of the *source* to the *target* or *focus* of the rule.

(We only study *single-feature assimilation*!)

Feature-filling (or, *structure-building*) operation: the assimilating segment is unspecified for the relevant feature.

Study (6a,b,c) on p. 150-151.

structure-changing operation: the segment is specified for a feature undelyingly.

The *delinking* of the original feature is represented by “z” in the rule.

Study (7a,b,c) on p. 151.

Assimilation: association of a node in the graph with the appropriate mother node of the adjacent segment.

Crucial: + or - values are not changed to agree with those of the adjacent segment:

The feature specification of the conditioning context spreads to the focus of the rule, resulting in a single feature specification that extends over two successive segments.
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