Features

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1 Some more comments on ROTB in OT

Prince and Smolensky write 2004, p. 225:

Under the thesis that might be dubbed *Richness of the Base*, which holds that all inputs are possible in all languages, distributional and inventory regularities follow from the way the universal input set is mapped onto an output set by the grammar, a language-particular ranking of the constraints. This stance makes maximal use of theoretical resources already required, avoiding the loss of generalization entailed by adding further language-particular apparatus devoted to input selection. (In this we . . . we deal with Kisseberth’s ‘duplication problem’ by having no duplication.)

What is the duplication problem? It is the fact that in SPE, generalizations at the surface level derive from two sources: the morpheme structure constraints and the presence/absence of rules. Richness of the Base eliminates the MSCs entirely. The explanation lies entirely within the mapping, which itself is defined by the ranking of the markedness and faithfulness constraints.

2 Features

In this part of the course, I want you to learn the following items.

- We can talk about features at two levels: the concrete, surface, *phonetic* level and the abstract, underlying, *phonological* level.
- A modern set of phonetic features is provided by Hayes (2009, Chapter 4).
- There is some consensus that abstract phonological features are the surface phonetic features are the *contrastive* or *distinctive*. Determining these is not as straightforward as one might think (Dresher, 2009).
• One issue is how much can the abstract features deviate from their phonetic surface correlate.

• Non-contrastive features (also called *redundant* features) have to get “filled in” somehow for the phonetic component to produce the sounds.

• The *Contrastive Hypothesis* is that all phonological generalizations can only refer to constrastive features (Curry-Hall, 2007).

• Features are a rich area of ongoing research today (see for instance (Mielke, 2008)).

3 Why features?

Features define natural classes, groups of sounds that are commonly involved in phonological generalizations. These groups of sounds are not necessarily apparent from the IPA. There is a sense that it is the *features* of the sounds that are relevant and not the sounds themselves.

For example, English has no voiceless velar fricative [x] like German. But we can pronounce it sometimes like in the name of the composer *Bach*. What if English speakers add plural or possessive suffixes to this word with its German pronunciation. We know the form of the suffix, even though we don’t have experience with [x].

4 Oppositions

The notion of phonological feature derives from the notion of *opposition*.

★ Consider the sounds [p, pʰ, b, bʰ, t, tʰ, d, dʰ, k, kʰ, g, gʰ] in Nepali. Below are some minimal pairs. Assume there are minimal or near-minimal pairs for all combinations. Explain why the pair illustrating the [p/pʰ] distinction is more informative in a way than the pair illustrating the [t/kʰ] distinction. What phonetic dimensions must be associated with each contrast?

<table>
<thead>
<tr>
<th>[pir] ‘anxiety, pain’</th>
<th>[bar] ‘fence’</th>
</tr>
</thead>
<tbody>
<tr>
<td>[pʰir] ‘Turn on!’</td>
<td>[bʰar] ‘burden’</td>
</tr>
<tr>
<td>[tal] ‘lake’</td>
<td>[dar] ‘a kind of tree’</td>
</tr>
<tr>
<td>[tʰal] ‘plate’</td>
<td>[dʰar] ‘edge’</td>
</tr>
<tr>
<td>[kal] ‘time, death’</td>
<td>[gol] ‘circle, charcoal’</td>
</tr>
<tr>
<td>[kʰal] ‘kind, skin’</td>
<td>[gʰol] ‘Mix! Stir!’</td>
</tr>
</tbody>
</table>
5 Distinctive Feature Theory

5.1 Trubetzkoy

Nikolai Sergeevich Trubetzkoy (1890–1938), Russian linguist, used the term opposition to refer to a pair of speech sounds that are distinctive, or contrastive. In other words, for those pairs of sounds for which we can find a minimal or near-minimal pair. He classified these oppositions in the following ways:

- **Bilateral** oppositions are those where two members of an opposition have sufficiently many phonetic properties in common which distinguish them from every other member of an opposition.

- **Multilateral** oppositions are those which are not bilateral.

- An opposition is proportional if and only if the relation between its members is identical with the relation between the members of another opposition or several other oppositions of the same system.

- An opposition which is not proportional is isolated.

- Oppositions wherein one member carries some phonetic property that the other lacks are said to be privative. The member carrying the phonetic property is said to be marked. This is the origin of the term markedness in phonology, which today means either “less-common”, “dispreferred”, or “ill-formed.”

- **Gradual** oppositions are those where members of an opposition differ in some degree of some phonetic property.

- When members of an opposition differ in a way that is neither privative nor gradual, it is said to be equipollent.

- An opposition is neutralizable iff it occurs in certain contexts. Otherwise it is constant.

★★ Explain why this paradigm from German establishes that the /t,d/ opposition is neutralizable.

| [rat] advice | [rɛːtə] advices |
| [rat] wheel | [rɛːdər] wheels |

(Hyman, 1975, p. 29): “With these notions, Trubetzkoy was able to reveal how the same phonetic contrast may structure differently in different languages.”
5.2 Jakobson

Jakobson introduced the notion of distinctive feature into phonological theory.

“While Trubetzkoy’s concern was to capture the phonological properties of such frequent phonetic contrasts as voicing in consonants and height in vowels, the concerns of Jakobson, another founding member of the Prague School, were somewhat different. Jakobson wanted to develop a theory of phonology which would predict only those oppositions which could be found in languages. In particular, he hypothesized that the presence of certain phonetic oppositions precludes the presence of other oppositions. For example, in works such as Jakobson, Fant and Halle (1952) and Jakobson and Halle (1956) it is maintained that languages do not have contrasts between labialized, velarized, and pharyngealized consonants, that is, /C\textsuperscript{w}/, /C\textsuperscript{v}/, and /C\textsuperscript{b}/, respectively. Jakobson claimed that a given language will contrast only one of these three consonant types with a plain /C/. Thus, while there can be an opposition between /C/ and /C\textsuperscript{w}/, /C/ and /C\textsuperscript{v}/, and /C/ and /C\textsuperscript{b}/, one cannot find an opposition between /C\textsuperscript{w}/ and /C\textsuperscript{v}/, /C\textsuperscript{v}/ and /C\textsuperscript{b}/, or /C\textsuperscript{w}/ and /C\textsuperscript{b}/. This mutual exclusiveness of these three kinds of consonants led Jakobson, Fant and Halle to propose that they are merely surface phonetic realizations of the same underlying feature of flatness (see below). They hypothesized that there are a limited number of such features, say 12 to 15, which together account for all of the oppositions found in the world’s languages.

Since many more than 12 to 15 phonetic features are necessary to differentiate the various sounds occurring in languages, it becomes apparent that some of these phonetic features will be “conflated” into the more limited set of phonological or distinctive features. This represents, then, a major departure from earlier phonetic studies of speech sounds. In the work of other phoneticians and phonologists, there is an assumption that the same features are to be used to characterize phonological contrasts in a language and to describe the phonetic content of various speech sounds. Jakobsen’s position is that there are certain phonetic distinctions, such as labialization, velarization, and pharyngealization, which are not available per se as phonological features but rather are representative of the more basic phonological feature of flatness. Thus, for the first time, the possibility is entertained that the set of phonological features may not be the same as the set of phonetic features.”

(Hyman, 1975, p. 30)

Two other innovations of Jakobson: the use of acoustic features and the requirement that all features are binary. The motivations again come from typological considerations.

With respect to binary features, it is logically possible that sounds could be voiceless, barely voiced, somewhat voiced, somewhat fully voiced, and fully voiced. But in fact languages only seem to make a 2-way distinction. Since Trubetzkoy considered voicing a privative opposition, he was (at least implicitly) making a similar claim.
With respect to acoustic features, Jakobson was interested in determining which features define natural classes of sounds. The set of sounds sharing a feature form a natural class. These classes ought to be reflected in the phonological patterning of sounds across languages.

Exercises:

1. Binary features most naturally describe privative oppositions. How can binary features describe gradual or equipollent oppositions?

2. If the phonemes are only identified by distinctive features then what determines the phonetic realization of the phoneme? How could these language-specific instructions be formalized?

6 Hayes 2009 and Features

In this course, we will rely on Hayes (2009) for the feature system used in this course.

6.1 Manner features for consonants

Sonority:

- greater sonority
- vowels
- glides
- liquids
- nasals
- less sonority
- obstruents

Phonological rules commonly reference contiguous regions of the hierarchy but not disjoint regions.

Feature Definitions:

sonorant if there is no build up of air pressure in the oral cavity, the sound is [+sonorant]. If there is, it is [-sonorant] and is called an obstruent.

approximant This is defined in acoustic terms as a cutoff along the hierarchy.

consonantal Likewise.

syllabic Segments which form the nucleus of a syllable are [+syllabic] and others are [-syllabic].

Stops, affricates and fricatives are obstruents.
Manner features for obstruents:

**continuant** Sounds which involve a full closure are [-continuant]; others are [+continuant].

**delayed release** Sounds which have a period of semi-closure where frication noise is produced are [+delayed release]; others are [-delayed release].

*Exercises:*

1. Reconstruct the traditional manner categories with these features, using the fewest number of features if possible.

2. Explain why stops and approximants do not form a natural class.

### 6.2 Vowel features

Vowel features

**+back** correspond to IPA back vowels.

**+front** correspond to IPA front vowels.

**+high** are defined as everything above the close-mid level in the IPA chart.

**+low** are defined as everything below the open-mid level in the IPA chart.

**+tense** are vowels which the tongue body is tensed (this creates a small height distinction among the high, mid, and low vowels).

Summary of vowel features
6.3 Place features for consonants

6.3.1 Major place features

+labial, articulated with the lips
+coronal, articulated with the tongue blade/tip
+dorsal, articulated with the tongue body

6.3.2 Minor place features for coronal consonants

+anterior, articulated at the alveolar ridge or further forward in the mouth
+distributed, articulated with tongue blade (contact is long from front to back)
+strident, articulated with a groove in the tongue channeling air towards the teeth
+lateral, articulated so that air passes laterally around the tongue

6.3.3 Minor place features for labial consonants

+round, articulated by rounding the lips
+labiodental, articulated by touching the lower lip to the upper teeth

6.3.4 Minor place features for dorsal consonants

![Diagram]

- high, low
- front, back
- central, back
- fronted, central
- high front vowels
- central vowels
- back vowels
- uvulars
- mid back vowels
- pharyngeals
- low back vowels

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6.4 Laryngeal features

+voice articulation involves vocal cord vibration

+spread glottis articulation involves placing the vocal cords far apart

+constricted glottis articulation involves placing the vocal cords close together

6.5 Other features

There are some other features I haven’t mentioned here that are also important. These include [nasal] and [strident]. Check the book!

References


