Phonological features

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Prof. Hargus
Feature

• Segments are not indivisible units, but are composed of features. E.g. a feature matrix for /t/:

[-continuant]
[-sonorant]
[+coronal]
[-voiced]

(an unordered list; re possible internal structure for features, see Hayes 4.6.6)

• feature definitions: usually articulatory

• feature values: +, -, 0
  – 0 = n.a. to segment
Functions of features

• A feature system must be able to
  – Describe classes of sounds
  – Distinguish phonemes
  – Specify phonetic detail
Describe classes

• # features inversely proportional to size of class
  – [p t k b d g]: [-continuant, -sonorant]]
  – [p]: [-continuant, -sonorant, -voiced, +labial]

• (check out FeaturePad from Bruce Hayes’ web site)
  – http://www.linguistics.ucla.edu/people/hayes/120a/FeaturePad.htm
Terminological diffs

<table>
<thead>
<tr>
<th>traditional phonetic term</th>
<th>phonological feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>stop</td>
<td>[-continuant]</td>
</tr>
<tr>
<td>nasal</td>
<td>[+nasal]</td>
</tr>
<tr>
<td>round</td>
<td>[+round]</td>
</tr>
<tr>
<td>labiodental</td>
<td>[+labiodental]</td>
</tr>
</tbody>
</table>

etc.

why diffs? Hayes (p. 74): phonolog classes are broader than phonetic terms
Operations on features

• Formally, phonological rules are operations on features
  – A phonological rule adds a feature or changes some value of an already specified feature

• In a phonological rule, --> is therefore a metaphor for ‘change’ or ‘add’.
• Phonological rules identify classes of sounds via feature(s)

• Justification: some phonological rules occur relatively frequently across languages while conceivable rules are rare or non-existent
  – E.g. post-nasal voicing of stops is common, typically affecting all stops of some language:
• /p t k/ --> [b d g] / {m n η} ___

• Hypothetical consonant inventory

<table>
<thead>
<tr>
<th></th>
<th>p</th>
<th>t</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>f</td>
<td>s</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>m</td>
<td>n</td>
<td>η</td>
<td></td>
</tr>
<tr>
<td></td>
<td>l</td>
<td></td>
<td></td>
</tr>
<tr>
<td>w</td>
<td>r</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• But Post-nasal voicing’ is not attested
  – *p f x --> [b v γ] / {m n η} ___
• If rules are stated in terms of segments, then the unattested and common rules are equally complex.

• Generative phonology: Phonological formalism should model common phenomena in a simple way. Rare/non-existent/unattested phenomena should be more complicated to describe.

• (An example of “Devise restricted architecture for description”)
If rules are stated in terms of features:

the common rule:
-continuant  -->  [+voiced]  / [+nasal] _____
-sonorant

(i.e. oral stops are voiced after nasals)

the unattested rule:
-continuant
-sonorant
+labial  -->  [+voiced]  / [+nasal] _____
or
+continuant
-sonorant
-coronal

(notice difference in “elegance” too)
Features in Hayes 2009

- Typos to correct, p. 96
1 Natural classes

Assume the vowel inventory shown in table 4.11 and the features [high], [low], [back], and [round] as defined in §4.10.3. For the sake of simplicity, ignore [front].

Table 4.11 Vowel chart for exercise 1

<table>
<thead>
<tr>
<th>Vowels:</th>
<th>Front</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unrounded</td>
<td>Rounded</td>
</tr>
<tr>
<td>high</td>
<td>i</td>
<td>y</td>
</tr>
<tr>
<td>mid</td>
<td>e</td>
<td>ø</td>
</tr>
<tr>
<td>low</td>
<td>æ</td>
<td>æ</td>
</tr>
</tbody>
</table>

a. Find as many natural classes as you can that have four members. List them, and define the natural class using features.
b. Find as many natural classes as you can that have six members. List them, and define the natural class using features.
c. Find as many natural classes as you can that have eight members. List them, and define the natural class using features.
d. Find as many natural classes as you can that have five members.
e. Explain why [y, e] is not a natural class.

“natural class” defined on p. 43
2 Hypothetical language

A hypothetical language has the phonemes shown in table 4.12.

Table 4.12 Consonant chart for exercise 2

<table>
<thead>
<tr>
<th>Consonants</th>
<th>Labial</th>
<th>Alveolar</th>
<th>Palatoalveolar</th>
<th>Fronted Velar</th>
<th>Velar</th>
<th>Uvular</th>
<th>Pharyngeal</th>
<th>Glottal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stops</td>
<td>p</td>
<td>t</td>
<td></td>
<td>k</td>
<td>k</td>
<td>q</td>
<td></td>
<td>?</td>
</tr>
<tr>
<td>Affricates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fricatives</td>
<td>f</td>
<td>s</td>
<td>j</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>h</td>
<td>h</td>
</tr>
<tr>
<td>Nasals</td>
<td>m</td>
<td>n</td>
<td>n</td>
<td>η</td>
<td>η</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquids:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tap</td>
<td></td>
<td></td>
<td></td>
<td>r</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lateral</td>
<td></td>
<td></td>
<td></td>
<td>l</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glides</td>
<td>w</td>
<td></td>
<td></td>
<td></td>
<td>j</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Vowels: as in previous problem.

Write the following phonological rules of this language using the features presented in this chapter. In each case I have indicated the real-life rule on which I have modeled the imaginary rule. Some problems will arise in notation; read the footnotes for help with these.
1. [i, y, u] become [e, o, y, o] before [q, n].  
   (modeled on Eskimo languages)
2. [t] becomes [ts] before [i, y, u].  
   (modeled on Japanese)
   (modeled on Ilokano)
4. When a member of the group [s, ðs, ñ] is followed by a member of the group  
   [s, ñ], the resulting cluster is broken up by the insertion of [i]. Use features,  
   not a phonetic symbol, for [i].  
   (modeled on English)
5. [n] assimilates in place to a following stop or affricate.  
   (modeled on Ilokano)
6. All consonants except /t, ðs, s, n, r, l, ñ/ delete word-finally.  
   (modeled on Lardil (Australia))
   (modeled on Latin)
8. [?] changes places with an immediately following glide.  
   (modeled on Ilokano)
9. All unrounded vowels become [a], and all rounded vowels become [o],  
   before [h].  
   (modeled on Maltese Arabic)
10. [e] and [æ] become [ø] and [o] if a [ø] or [o] occurs in the preceding  
    syllable.  
    (modeled on Khalkha Mongolian)
11. [k, x, ñ] become [k, x, ñ] after [i, j].  
    (modeled on German)