Formalizing contrast and redundancy in phonological representations

Daniel Currie Hall
Saint Mary’s University

Phonological Theory Agora workshop • GLOW 41 • Budapest • April 2018
Why (just) representations?

Two components of a formal model of phonology:
1. Operations

...
Why (just) representations?

Two components of a formal model of phonology:

1. Operations, e.g:
   
   $x \rightarrow y/w___z$
Why (just) representations?

Two components of a formal model of phonology:

1. Operations, e.g:
   - $x \rightarrow y/w\ldots z$
   - Generate candidates and evaluate them against a constraint ranking
Why (just) representations?

Two components of a formal model of phonology:

1. Operations, e.g:
   - $x \rightarrow y/w\ldots z$
   - Generate candidates and evaluate them against a constraint ranking

2. Representations
Why (just) representations?

Two components of a formal model of phonology:

1. Operations, e.g:
   - $x \rightarrow y/u\ldots z$
   - Generate candidates and evaluate them against a constraint ranking

2. Representations, e.g.:
   - [+syllabic]
     - [−high]
     - [−low]
     - [+back]
     - [+round]
     - …
Why (just) representations?

Two components of a formal model of phonology:

1. Operations, e.g:
   - \( x \rightarrow y/u\hat{}z \)
   - **Generate** candidates and **Evaluate** them against a **Constraint** ranking

2. Representations, e.g.:
   - \( [+\text{syllabic}] [+\text{back}] [+\text{round}] \)
   - \( -\text{high} -\text{low} \)
   - \( \text{N} \)
   - \( \text{U} \)
   - \( \text{A} \)
Why (just) representations?

Two components of a formal model of phonology:

1. Operations, e.g:
   - \[ x \rightarrow y/w \quad \text{and} \quad z \]
   - Generate candidates and Evaluate them against a Constraint ranking

2. Representations, e.g.:
   - \[
   \begin{bmatrix}
   +\text{syllabic} \\
   -\text{high} \\
   -\text{low} \\
   +\text{back} \\
   +\text{round} \\
   \ldots
   \end{bmatrix}
   \]
   - N
   - x
   - U
   - A
Anderson (1985) describes the field as alternately paying more attention to one of these, then the other.
Why (just) representations?

- Anderson (1985) describes the field as alternately paying more attention to one of these, then the other.
- Phonological theories seldom fully formalize both aspects.
Anderson (1985) describes the field as alternately paying more attention to one of these, then the other. Phonological theories seldom fully formalize both aspects. This isn’t a bad thing.
Why (just) representations?

- Anderson (1985) describes the field as alternately paying more attention to one of these, then the other.
- Phonological theories seldom fully formalize both aspects.
- This isn’t a bad thing.
- In particular, focusing on representations can tell us things about what operations can and can’t do, independently of any specific theory of operations.
Why (just) representations?

A fanciful example: Hale and Reiss's (2008) NoBANANA
Why (just) representations?

- A fanciful example: Hale and Reiss's (2008) NoBanana

- If bananas just aren’t phonological objects, we can’t formulate, and don’t need, this constraint
A fanciful example: Hale and Reiss's (2008) NoBANANA

If bananas just aren’t phonological objects, we can’t formulate, and don’t need, this constraint

…or rules that insert, delete, or slice bananas.
More broadly: the content of representations restricts the power of operations.
Why (just) representations?

- More broadly: the content of representations restricts the power of operations.
- The phonological computation can only work with what it is given.
Why (just) representations?

- More broadly: the content of representations restricts the power of operations.
- The phonological computation can only work with what it is given.
- A methodology: Try the most parsimonious representations first
Why (just) representations?

- More broadly: the content of representations restricts the power of operations.
- The phonological computation can only work with what it is given.
- A methodology: Try the most parsimonious representations first
- ...because they should be the easiest to falsify.
Lexical contrast identifies the minimum of information we need.
Lexical contrast identifies the minimum of information we need. Each phoneme must have enough features (or elements, etc.) to distinguish it from the others with which it contrasts.
Why contrast?

- Lexical contrast identifies the minimum of information we need.
- Each phoneme must have enough features (or elements, etc.) to distinguish it from the others with which it contrasts.
- The opposite end of the continuum—the maximum amount of information—is harder to falsify and harder to identify.
Why contrast?

- Lexical contrast identifies the minimum of information we need.
- Each phoneme must have enough features (or elements, etc.) to distinguish it from the others with which it contrasts.
- The opposite end of the continuum—the maximum amount of information—is harder to falsify and harder to identify.
- We could store phonetic details of every token of every unit (word? morpheme? phone?) the speaker is exposed to.
Lexical contrast identifies the minimum of information we need. Each phoneme must have enough features (or elements, etc.) to distinguish it from the others with which it contrasts. The opposite end of the continuum—the maximum amount of information—is harder to falsify and harder to identify. We could store phonetic details of every token of every unit (word? morpheme? phone?) the speaker is exposed to. Some of this information may be relevant to:
Why contrast?

- Lexical contrast identifies the minimum of information we need.
- Each phoneme must have enough features (or elements, etc.) to distinguish it from the others with which it contrasts.
- The opposite end of the continuum—the maximum amount of information—is harder to falsify and harder to identify.
- We could store phonetic details of every token of every unit (word? morpheme? phone?) the speaker is exposed to.
- Some of this information may be relevant to:
  - identifying individual speakers
Lexical contrast identifies the minimum of information we need.
Each phoneme must have enough features (or elements, etc.) to
distinguish it from the others with which it contrasts.
The opposite end of the continuum—the maximum amount of
information—is harder to falsify and harder to identify.
We could store phonetic details of every token of every unit (word?
morpheme? phone?) the speaker is exposed to.
Some of this information may be relevant to:
- identifying individual speakers
- recognizing accents
Lexical contrast identifies the minimum of information we need.
Each phoneme must have enough features (or elements, etc.) to distinguish it from the others with which it contrasts.
The opposite end of the continuum—the maximum amount of information—is harder to falsify and harder to identify.
We could store phonetic details of every token of every unit (word? morpheme? phone?) the speaker is exposed to.
Some of this information may be relevant to:
- identifying individual speakers
- recognizing accents
- identifying affect
Lexical contrast identifies the minimum of information we need. Each phoneme must have enough features (or elements, etc.) to distinguish it from the others with which it contrasts.

The opposite end of the continuum—the maximum amount of information—is harder to falsify and harder to identify.

We could store phonetic details of every token of every unit (word? morpheme? phone?) the speaker is exposed to.

Some of this information may be relevant to:
- identifying individual speakers
- recognizing accents
- identifying affect

But if we start by assuming it’s all also available to the grammar, what would ever tell us that some of it isn’t there?
Also, contrastive features (at least sometimes) do things that redundant ones don’t.
Also, contrastive features (at least sometimes) do things that redundant ones don’t.

E.g., spreading of nasality in Sundanese (Piggott 1992: 41)

(1) \[\text{ŋ} \quad \text{a} \quad \text{j} \quad \text{a} \quad \text{k}\]

\[
\begin{array}{c}
\bullet \\
\bullet \\
\bullet \\
\bullet \\
\bullet \\
\bullet \\
\bullet
\end{array}
\]
Why contrast?

- Also, contrastive features (at least sometimes) do things that redundant ones don’t.
- E.g., spreading of nasality in Sundanese (Piggott 1992: 41)

(1) \( \eta \quad a \quad j \quad a \quad k \)

- Consonants contrast for \([\pm \text{nasal}]\); vowels don’t.
Why contrast?

- Also, contrastive features (at least sometimes) do things that redundant ones don’t.
- E.g., spreading of nasality in Sundanese (Piggott 1992: 41)

(1) \[ \eta \ a \ j \ a \ k \]

- Consonants contrast for \([\pm\text{nasal}]\); vowels don’t.
- Consonants spread and block nasality.
Also, contrastive features (at least sometimes) do things that redundant ones don’t.

E.g., spreading of nasality in Sundanese (Piggott 1992: 41)

Consonants contrast for [±nasal]; vowels don’t.

Consonants spread and block nasality.

Vowels are targets of spreading.
Why contrast?

- Scope matters.
Why contrast?

- Scope matters.
- Piggott (1992):
  - Sundanese glides pattern with consonants (blocking nasal spread).
  - Malay glides pattern with vowels (subject to nasalization).
Why contrast?

- Scope matters.
- Piggott (1992):
  - Sundanese glides pattern with consonants (blocking nasal spread).
  - Malay glides pattern with vowels (subject to nasalization).
- Neither Sundanese nor Malay has underlyingly nasal glides.
Why contrast?

- Scope matters.
- Piggott (1992):
  - Sundanese glides pattern with consonants (blocking nasal spread).
  - Malay glides pattern with vowels (subject to nasalization).
- Neither Sundanese nor Malay has underlyingly nasal glides.
- The difference is in whether the glides are counted as belonging to the set of sounds in which nasalization is contrastive.
Why contrast?

- Scope matters.
- Piggott (1992):
  - Sundanese glides pattern with consonants (blocking nasal spread).
  - Malay glides pattern with vowels (subject to nasalization).
- Neither Sundanese nor Malay has underlyingly nasal glides.
- The difference is in whether the glides are counted as belonging to the set of sounds in which nasalization is contrastive.

(2) Sundanese:

```
[+cons]  [−cons]
[+nasal] [−nasal]
/m n p η/  /j w l r .../ 
```

≺ 8 ≻
Why contrast?

- Scope matters.
- Piggott (1992):
  - Sundanese glides pattern with consonants (blocking nasal spread).
  - Malay glides pattern with vowels (subject to nasalization).
- Neither Sundanese nor Malay has underlyingly nasal glides.
- The difference is in whether the glides are counted as belonging to the set of sounds in which nasalization is contrastive.

(2) Sundanese:  (3) Malay:

```
(+cons)  [–cons]
  /ʔ h a i…/
(+nasal) [–nasal] /m n ŋ ŋ /
/j w l r ...
```

```
(+cons)  [–cons]
  /j w ? h a i…/
(+nasal) [–nasal] /m n ŋ ŋ /
/ l r ...
```
Reiss (2017): “Contrast is Irrelevant in Phonology.”
Reiss (2017): “Contrast is Irrelevant in Phonology.”

Accounts of harmony often attribute neutrality to the absence of contrast.
Reiss (2017): “Contrast is Irrelevant in Phonology.”

Accounts of harmony often attribute neutrality to the absence of contrast.

But in Tangale ATR harmony, /a/ patterns with other [-ATR] vowels, even though it has no [+ATR] counterpart.
Why contrast?

- Reiss (2017): “Contrast is Irrelevant in Phonology.”
- Accounts of harmony often attribute neutrality to the absence of contrast.
- But in Tangale ATR harmony, /a/ patterns with other [−ATR] vowels, even though it has no [+ATR] counterpart.
- This ignores the idea of contrastive scope—there’s no [+ATR] vowel in Tangale that is otherwise identical to /a/, but /a/ does contrast with [+ATR] vowels in general.  
  (See Archangeli (1988) and Dresher (2009: ch. 2) on why pairwise comparison of segments is not the best way to identify contrastive features.)
Also from Reiss (2017): Sonorants’ failure to trigger voicing assimilation in many languages is often attributed to their lack of contrastive voicing.
Also from Reiss (2017): Sonorants’ failure to trigger voicing assimilation in many languages is often attributed to their lack of contrastive voicing.

In Russian, sonorants don’t have voiceless counterparts, and they don’t trigger assimilatory voicing.
Also from Reiss (2017): Sonorants’ failure to trigger voicing assimilation in many languages is often attributed to their lack of contrastive voicing.

In Russian, sonorants don’t have voiceless counterparts, and they don’t trigger assimilatory voicing.

But neither does /v/, even though it contrasts with voiceless /f/.
Also from Reiss (2017): Sonorants’ failure to trigger voicing assimilation in many languages is often attributed to their lack of contrastive voicing.

In Russian, sonorants don’t have voiceless counterparts, and they don’t trigger assimilatory voicing.

But neither does /v/, even though it contrasts with voiceless /f/.

Reiss’s proposal: Russian /v/ isn’t a sonorant (contra Lightner 1965; Hayes 1984; Kiparsky 1985), nor is its phonetic resemblance to a sonorant relevant (contra Padgett 2002); it’s just not specified for [+voice].
Also from Reiss (2017): Sonorants’ failure to trigger voicing assimilation in many languages is often attributed to their lack of contrastive voicing.

In Russian, sonorants don’t have voiceless counterparts, and they don’t trigger assimilatory voicing.

But neither does /v/, even though it contrasts with voiceless /f/.

Reiss’s proposal: Russian /v/ isn’t a sonorant (*contra* Lightner 1965; Hayes 1984; Kiparsky 1985), nor is its phonetic resemblance to a sonorant relevant (*contra* Padgett 2002); it’s just not specified for [+voice].

(This is, oddly enough, pretty much the approach taken within a contrastive-specification framework by Avery 1996 and Hall 2004, though they use monovalent features.)
Reiss (2017: 29) claims that “appeals to contrast are opportunistic.”
Reiss (2017: 29) claims that “appeals to contrast are opportunistic.” If so, they’re ‘opportunistic’ in the same way that appeals to natural classes are.
Reiss (2017: 29) claims that “appeals to contrast are opportunistic.”
If so, they’re ‘opportunistic’ in the same way that appeals to natural classes are.
The computational system has the power to apply the same change in an arbitrary combination of environments.
Reiss (2017: 29) claims that “appeals to contrast are opportunistic.”
If so, they’re ‘opportunistic’ in the same way that appeals to natural classes are.
The computational system has the power to apply the same change in an arbitrary combination of environments.
And it probably needs it—e.g.:

Arapaho (Gleim 2018): \( i \rightarrow u / o \begin{cases} \text{velar} \\ \theta \end{cases} \begin{cases} \text{glottal} \end{cases} \)
Reiss (2017: 29) claims that “appeals to contrast are opportunistic.”

If so, they’re ‘opportunistic’ in the same way that appeals to natural classes are.

The computational system has the power to apply the same change in an arbitrary combination of environments.

And it probably needs it—e.g.:

Arapaho (Gleim 2018): $i \rightarrow u / o \begin{cases} \text{velar} \\ \text{glottal} \\ \theta \end{cases}$

But we still describe patterns in terms of natural classes when we can—and consider that we are missing generalizations if we don’t.
Reiss (2017: 29) claims that “appeals to contrast are opportunistic.” If so, they’re ‘opportunistic’ in the same way that appeals to natural classes are.

The computational system has the power to apply the same change in an arbitrary combination of environments.

And it probably needs it—e.g.:

Arapaho (Gleim 2018): $i \rightarrow u / o \left\{ \begin{array}{c} \text{velar} \\ \text{glottal} \\ \theta \end{array} \right\}$

But we still describe patterns in terms of natural classes when we can—and consider that we are missing generalizations if we don’t.

Likewise, we’re missing a generalization if we fail to note when segments on which [F] is predictable act as if they lack [F].
How contrast? Two approaches

We can give contrastive features special status either by excluding information from representations, or by adding information to them:
We can give contrastive features special status either by excluding information from representations, or by adding information to them:

**Subtractive:** Redundant features are absent from some or all of the phonological computation (e.g., Archangeli 1988; Dresher 2009; Mackenzie 2013).
We can give contrastive features special status either by excluding information from representations, or by adding information to them:

**Subtractive:** Redundant features are absent from some or all of the phonological computation (e.g., Archangeli 1988; Dresher 2009; Mackenzie 2013).

**Additive:** Both contrastive and redundant features are phonologically visible, and the computation can distinguish between them (e.g., Calabrese 1995; Halle, Vaux, and Wolf 2000; Nevins 2010).
How contrast? Two approaches

‘Full’ specification:

<table>
<thead>
<tr>
<th>t</th>
<th>d</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>[−voice]</td>
<td>[+voice]</td>
<td>[+voice]</td>
</tr>
</tbody>
</table>
How contrast? Two approaches

‘Full’ specification:

\[
\begin{array}{ccc}
t & d & n \\
[-\text{voice}] & [+\text{voice}] & [+\text{voice}]
\end{array}
\]

The subtractive approach:

\[
\begin{array}{ccc}
t & d & n \\
[-\text{voice}] & [+\text{voice}]
\end{array}
\]
How contrast? Two approaches

‘Full’ specification:  

<table>
<thead>
<tr>
<th>t</th>
<th>d</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>[−voice]</td>
<td>[+voice]</td>
<td>[+voice]</td>
</tr>
</tbody>
</table>

The subtractive approach:

<table>
<thead>
<tr>
<th>t</th>
<th>d</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>[−voice]</td>
<td>[+voice]</td>
<td></td>
</tr>
</tbody>
</table>
**How contrast? Two approaches**

<table>
<thead>
<tr>
<th>‘Full’ specification:</th>
<th>The subtractive approach:</th>
</tr>
</thead>
<tbody>
<tr>
<td>t [−voice]</td>
<td>t [−voice]</td>
</tr>
<tr>
<td>d [+voice]</td>
<td>d [+voice]</td>
</tr>
<tr>
<td>n [+voice]</td>
<td>n [−voice]</td>
</tr>
</tbody>
</table>

An additive approach: ‘Paint redundant features blue’

|------------|------------|------------|------------|------------|------------|
How contrast? Two approaches

<table>
<thead>
<tr>
<th>‘Full’ specification:</th>
<th>The subtractive approach:</th>
</tr>
</thead>
<tbody>
<tr>
<td>t [-voice]</td>
<td>t [-voice]</td>
</tr>
<tr>
<td>d [+voice]</td>
<td>d [+voice]</td>
</tr>
<tr>
<td>n [+voice]</td>
<td>n [+voice]</td>
</tr>
</tbody>
</table>

An additive approach: ‘Paint redundant features blue’

<table>
<thead>
<tr>
<th>t [-voice]</th>
<th>d [+voice]</th>
<th>n [+voice]</th>
</tr>
</thead>
<tbody>
<tr>
<td>t [-voice]</td>
<td>d [+voice]</td>
<td>n [+voice]</td>
</tr>
</tbody>
</table>
Uyghur vowel harmony

- Uyghur (Turkic) reveals the limits of blue paint (Halle, Vaux, and Wolf 2000).

<table>
<thead>
<tr>
<th></th>
<th>FRONT</th>
<th>BACK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UNRND</td>
<td>ROUND UNRND</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>a</td>
</tr>
</tbody>
</table>

Table 1: Vowel inventory of Uyghur
Uyghur vowel harmony

- Uyghur (Turkic) reveals the limits of blue paint (Halle, Vaux, and Wolf 2000).
- Vowel harmony (like Finnish):

<table>
<thead>
<tr>
<th></th>
<th>FRONT</th>
<th>BACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH</td>
<td>i ROUND</td>
<td>u UNRND</td>
</tr>
<tr>
<td>MID</td>
<td>e UNRND</td>
<td>o ROUND</td>
</tr>
<tr>
<td>LOW</td>
<td>æ UNRND</td>
<td>α ROUND</td>
</tr>
</tbody>
</table>

**Table 1:** Vowel inventory of Uyghur
Uyghur vowel harmony

- Uyghur (Turkic) reveals the limits of blue paint (Halle, Vaux, and Wolf 2000).
- Vowel harmony (like Finnish):
  - u o a are back

<table>
<thead>
<tr>
<th></th>
<th>FRONT</th>
<th>BACK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UNRND</td>
<td>ROUND</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></td>
</tr>
</tbody>
</table>

Table 1: Vowel inventory of Uyghur
Uyghur vowel harmony

- Uyghur (Turkic) reveals the limits of blue paint (Halle, Vaux, and Wolf 2000).

- Vowel harmony (like Finnish):
  - u o α are back
  - y ø æ are front

<table>
<thead>
<tr>
<th></th>
<th>FRONT UNRND</th>
<th>FRONT ROUND</th>
<th>BACK UNRND</th>
<th>BACK ROUND</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH</td>
<td>i</td>
<td>y</td>
<td>u</td>
<td></td>
</tr>
<tr>
<td>MID</td>
<td>e</td>
<td>ø</td>
<td>o</td>
<td></td>
</tr>
<tr>
<td>LOW</td>
<td>æ</td>
<td></td>
<td>α</td>
<td></td>
</tr>
</tbody>
</table>

**Table 1**: Vowel inventory of Uyghur
Uyghur vowel harmony

- Uyghur (Turkic) reveals the limits of blue paint (Halle, Vaux, and Wolf 2000).
- Vowel harmony (like Finnish):
  - u o ɑ are back
  - y ø æ are front
  - i e are neutral (though phonetically front)

<table>
<thead>
<tr>
<th></th>
<th>FRONT</th>
<th>BACK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UNRND</td>
<td>ROUND</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>a</td>
</tr>
</tbody>
</table>

Table 1: Vowel inventory of Uyghur
Rightward propagation of harmony to the plural suffix:
Uyghur vowel harmony

Rightward propagation of harmony to the plural suffix:

(4) a. [jyz-lær] ‘face-PL.’

(5) a. [pul-lar] ‘money-PL.’
Uyghur vowel harmony

- Rightward propagation of harmony to the plural suffix:

  (4)  a. [jyz- lær] ‘face-PL.’  
       b. [køl- lær] ‘lake-PL.’

  (5)  a. [pul- lar] ‘money-PL.’  
       b. [jol- lar] ‘road-PL.’
Rightward propagation of harmony to the plural suffix:

(4) a. [jyz-lær] ‘face-PL.’
    b. [køl-lær] ‘lake-PL.’
    c. [xæt-lær] ‘letter-PL.’
(5) a. [pul-lær] ‘money-PL.’
    b. [jol-lær] ‘road-PL.’
    c. [at-lær] ‘horse-PL.’
Uyghur vowel harmony

- Rightward propagation of harmony to the plural suffix:

  (4)  
  a. [jyz-lær] ‘face-PL.’  
  b. [køl-lær] ‘lake-PL.’  
  c. [xæt-lær] ‘letter-PL.’

  (5)  
  a. [pul-lar] ‘money-PL.’  
  b. [jol-lar] ‘road-PL.’  
  c. [at-lar] ‘horse-PL.’

- Transparency of /i/:
Uyghur vowel harmony

- Rightward propagation of harmony to the plural suffix:

  (4)  a. [jyz-lær] ‘face-PL.’  
       b. [køl-lær] ‘lake-PL.’  
       c. [xæt-lær] ‘letter-PL.’

  (5)  a. [pul-lar] ‘money-PL.’  
       b. [jol-lar] ‘road-PL.’  
       c. [at-lar] ‘horse-PL.’

- Transparency of /i/:

  (6)  [køl-imiz-gæ] ‘lake-our-DATIVE’
Rightward propagation of harmony to the plural suffix:

(4)  a. [jyz-lær] ‘face-PL.’  
     b. [køl-lær] ‘lake-PL.’  
     c. [xæt-lær] ‘letter-PL.’

(5)  a. [pul-lær] ‘money-PL.’  
     b. [jol-lær] ‘road-PL.’  
     c. [at-lær] ‘horse-PL.’

Transparency of /i/:

(6)  [køl-imiz-gæ] ‘lake-our-DATIVE’

(7)  [jol-imiz-ʁa] ‘road-our-DATIVE’
There are also non-alternating suffixes, such as -ʧæ.

(8) [tyrk-ʧæ] ‘(in the) Turkish (manner/language)’
There are also non-alternating suffixes, such as -ʧæ.

(8) [tyrk-ʧæ]  ‘(in the) Turkish (manner/language)’

This suffix remains [−back] after [+back] stems...

(9) [uj̱ur-ʧæ]  ‘(in the) Uyghur (manner/language)’
(10) [kitap-ʧæ]  ‘booklet’
There are also non-alternating suffixes, such as -ʧæ.

(8) [tyrk-ʧæ] ‘(in the) Turkish (manner/language)’

This suffix remains [−back] after [+back] stems...

(9) [ujur-ʧæ] ‘(in the) Uyghur (manner/language)’
(10) [kitap-ʧæ] ‘booklet’

…and can also transmit [−back] to a subsequent suffix:

(11) [kitap-ʧæ-m-dæ] ‘in my booklet’
Low vowels in medial open syllables raise to [i]:

(12) [bala] ‘child’ [balı-lar] ‘children’

(13) [iʃæk] ‘donkey’ [iʃiɣ-i] ‘his/her/its donkey’
Uyghur vowel harmony

Low vowels in medial open syllables raise to [i]:

(12) [bala] ‘child’  [bali-lar] ‘children’
(13) [iʃæk] ‘donkey’  [iʃiɣ-i] ‘his/her/its donkey’

When they do, they become transparent to harmony:

(14) [næj-tʃi-dæ] ‘child-tʃæ-LOCATIVE’
(15) [kitap-tʃi-da] ‘book-tʃæ-LOCATIVE’

Contrast (15) with (11):

(11) [kitap-tʃi-dæ-m] ‘in my booklet’
Uyghur vowel harmony

Low vowels in medial open syllables raise to [i]:

(12) [bala] ‘child’ [bali-lar] ‘children’

(13) [iʃæk] ‘donkey’ [iʃiɣ-i] ‘his/her/its donkey’

When they do, they become transparent to harmony:

(14) [næj-tʃi-dæ] ‘child-tʃæ-LOCATIVE’

(15) [kitap-tʃi-da] ‘book-tʃæ-LOCATIVE’

Contrast (15) with (11):

(11) [kitap-tʃæ-m-dæ] ‘in my booklet’
In Halle, Vaux, and Wolf’s (2000) additive account, we can’t just paint redundant features blue once and for all.
In Halle, Vaux, and Wolf’s (2000) additive account, we can’t just paint redundant features blue once and for all.

\[ \text{æ} \]

\[
\begin{bmatrix}
-\text{high} \\
+\text{low} \\
-\text{back} \\
-\text{round} \\
\ldots
\end{bmatrix}
\]
In Halle, Vaux, and Wolf’s (2000) additive account, we can’t just paint redundant features blue once and for all.

\[
\begin{align*}
  \ae & \quad \ni \\
  \begin{array}{l}
    -\text{high} \\
    +\text{low} \\
    -\text{back} \\
    -\text{round} \\
    \ldots
  \end{array} & \quad \rightarrow \quad \\
  \begin{array}{l}
    +\text{high} \\
    -\text{low} \\
    -\text{back} \\
    -\text{round} \\
    \ldots
  \end{array}
\end{align*}
\]

OPEN-$\sigma$
RAISING
In Halle, Vaux, and Wolf’s (2000) additive account, we can’t just paint redundant features blue once and for all.

<table>
<thead>
<tr>
<th>æ</th>
<th>i</th>
<th>i</th>
</tr>
</thead>
<tbody>
<tr>
<td>−high</td>
<td>+high</td>
<td>+high</td>
</tr>
<tr>
<td>+low</td>
<td>−low</td>
<td>−low</td>
</tr>
<tr>
<td>−back</td>
<td>−back</td>
<td>−back</td>
</tr>
<tr>
<td>−round</td>
<td>−round</td>
<td>−round</td>
</tr>
<tr>
<td>…</td>
<td>…</td>
<td>…</td>
</tr>
</tbody>
</table>

OPEN-σ RAISING  REASSESS CONTRAST
In Halle, Vaux, and Wolf’s (2000) additive account, we can’t just paint redundant features blue once and for all.

The status of a feature can’t be read from the representation.
In Halle, Vaux, and Wolf’s (2000) additive account, we can’t just paint redundant features blue once and for all.

\[
\begin{align*}
\text{æ} &\quad \rightarrow \\
\begin{bmatrix}
-\text{high} \\
+\text{low} \\
-\text{back} \\
-\text{round} \\
\ldots
\end{bmatrix} &\quad \rightarrow \\
\begin{bmatrix}
+\text{high} \\
-\text{low} \\
-\text{back} \\
-\text{round} \\
\ldots
\end{bmatrix} &\quad \rightarrow \\
\begin{bmatrix}
+\text{high} \\
-\text{low} \\
-\text{back} \\
-\text{round} \\
\ldots
\end{bmatrix}
\end{align*}
\]

- OPEN-\(\sigma\) RAISING
- REASSESS CONTRAST

The status of a feature can’t be read from the representation. It must be assessed based on the inventory, or on the marking statements (Calabrese 1995) that constrain the inventory.
The additive approach to Uyghur

(16) Marking statements:
   a. \([-\text{back}, +\text{round}] / [\_\_, -\text{low}]\) inactive in Uyghur
The additive approach to Uyghur

(16) Marking statements:
   a. \([-\text{back}, +\text{round}] / [__, -\text{low}]\) inactive in Uyghur

   a. \([\beta G]\) and its opposite \([-\beta G]\) are contrastive in a bundle \([\alpha F, __]\) of \(L\) if and only if \(M\) is deactivated in \(L\).
The additive approach to Uyghur

(16) Marking statements:
   a. \([-\text{back}, +\text{round}] / [\_, -\text{low}]\) inactive in Uyghur

   a. \([\beta G]\) and its opposite \([-\beta G]\) are contrastive in a bundle \([\alpha F, \_]\) of L if and only if \(\text{M}\) is deactivated in L.


\[\pm\text{round}\] is contrastive on (non-low) \([-\text{back}]\) segments.
(16) Marking statements:
   a. [−back, +round] / [___, −low] inactive in Uyghur
   b. [+back, −round] / [___, −low] active in Uyghur

   a. [βG] and its opposite [−βG] are contrastive in a bundle [αF, ___] of L if and only if M is deactivated in L.

[±round] is contrastive on (non-low) [−back] segments.
(16) Marking statements:
   a. \([{-\text{back}}, +\text{round}] / [___, -\text{low}]\) inactive in Uyghur
   b. \([{+\text{back}}, -\text{round}] / [___, -\text{low}]\) active in Uyghur

   a. \([\beta G]\) and its opposite \([{-\beta G}]\) are contrastive in a bundle \([\alpha F, ___]\) of L if and only if M is deactivated in L.
   b. \([\alpha F]\) is not contrastive in a bundle T \([___, -\beta G, \gamma D...]\) of L if \([{-\beta G}]\) is contrastive in T and there is an active marking statement or prohibition \([{-\alpha F}, -\beta G]\) in L.

\(\pm\text{round}\) is contrastive on (non-low) \([-\text{back}]\) segments.
The additive approach to Uyghur

(16) Marking statements:
   a. \([-\text{back}, +\text{round}] / [\_\_, -\text{low}]\) inactive in Uyghur
   b. \([+\text{back}, -\text{round}] / [\_\_, -\text{low}]\) active in Uyghur

   a. \([\beta G]\) and its opposite \([-\beta G]\) are contrastive in a bundle \([\alpha F, \_\_]\) of L if and only if \(M\) is deactivated in L.
   b. \([\alpha F]\) is not contrastive in a bundle \(T [\_\_, -\beta G, \gamma D\ldots]\) of L if \([-\beta G]\) is contrastive in \(T\) and there is an active marking statement or prohibition \([-\alpha F, -\beta G]\) in L.

- \([\pm \text{round}]\) is contrastive on (non-low) \([-\text{back}]\) segments.
- \([-\text{back}]\) is not contrastive on (non-low) \([-\text{round}]\) segments.
A subtractive approach

The additive approach requires rules to consult marking statements to know what features they should ignore.
A subtractive approach

- The additive approach requires rules to consult marking statements to know what features they should ignore.
- But the Uyghur facts potentially present a challenge for a subtractive approach, too.
A subtractive approach

- The additive approach requires rules to consult marking statements to know what features they should ignore.
- But the Uyghur facts potentially present a challenge for a subtractive approach, too.
- In the subtractive approach, redundant features are underlyingly absent (not just blue).
The additive approach requires rules to consult marking statements to know what features they should ignore.

But the Uyghur facts potentially present a challenge for a subtractive approach, too.

In the subtractive approach, redundant features are underlyingly absent (not just blue).

Is there a principled explanation for the fact that raising /æ/ to [i] makes its [−back] specification disappear?
A subtractive approach

- The additive approach requires rules to consult marking statements to know what features they should ignore.
- But the Uyghur facts potentially present a challenge for a subtractive approach, too.
- In the subtractive approach, redundant features are underlingly absent (not just blue).
- Is there a principled explanation for the fact that raising /æ/ to [i] makes its [−back] specification disappear?
- Yes—adapted from D’Arcy (2004), who uses a different set of features.
How do we know which features to include and which to omit?
How do we know which features to include and which to omit?

Dresher (2009): Features are organized into contrastive hierarchies.
A subtractive approach

THE CONTRASTIVE HIERARCHY

- How do we know which features to include and which to omit?
- Drescher (2009): Features are organized into contrastive hierarchies.
- [±back] will be unspecified on /i/ and /e/ if it has low scope.
A subtractive approach

THE CONTRASTIVE HIERARCHY

- How do we know which features to include and which to omit?
- Dresher (2009): Features are organized into contrastive hierarchies.
- \([\pm \text{back}]\) will be unspecified on /i/ and /e/ if it has low scope:

\[(18)\]

\[
\begin{array}{c}
[+\text{low}] \\
[+\text{back}] & [-\text{back}] \\
/\text{a/} & /\text{æ/} \\
\end{array}
\begin{array}{c}
[-\text{low}] \\
[+\text{round}] & [-\text{round}] \\
/\text{e i/} \\
\end{array}
\begin{array}{c}
[+\text{back}] & [-\text{back}] \\
/\text{o u/} & /\text{ø y/} \\
\end{array}
\]
Open-syllable raising is reduction…
Open-syllable raising is reduction…
  ...of sonority
Open-syllable raising is **reduction**…
- …of sonority
- …and of structure (as in Pöchtrager 2018, among others).
A subtractive approach

Open-syllable raising is **reduction**…
- ...of sonority
- ...and of structure (as in Pöchtrager 2018, among others).

Recall that it neutralizes the contrast between /æ/ and /ɑ/:
Open-syllable raising is reduction…

...of sonority
...and of structure (as in Pöchtrager 2018, among others).

Recall that it neutralizes the contrast between /æ/ and /a/:

(12) [bala] ‘child’ [bali-lar] ‘children’
A subtractive approach

RAISING AS REDUCTION

- Open-syllable raising is **reduction**…
  - …of sonority
  - …and of structure (as in Pöchtrager 2018, among others).

- Recall that it neutralizes the contrast between /æ/ and /ɑ/:

  (12) [bala] ‘child’  [bali-lar] ‘children’
  (13) [ifæk] ‘donkey’  [ifiy-i] ‘his/her/its donkey’
Open-syllable raising is reduction…

...of sonority

...and of structure (as in Pöchtrager 2018, among others).

Recall that it neutralizes the contrast between /æ/ and /ɑ/:

(12) \([\text{bɛ} \text{la}]\) ‘child’ \([\text{bɛli-} \text{lɛ}]\) ‘children’

(13) \([\text{iʃ} \text{ɛk}]\) ‘donkey’ \([\text{iʃi} \text{ɣ-i}]\) ‘his/her/its donkey’

Rather than saying that raising imposes \([-\text{back}]\), we can say that it deletes \([±\text{back}]\).
A subtractive approach

RAISING AS REDUCTION

- Open-syllable raising changes /æ/ and /ɑ/ from low to high, and removes their specifications for [±back]:

\[ æ [\text{low}] \rightarrow \text{low} \rightarrow [\text{high}] \]
\[ α [\text{low}+\text{back}] \rightarrow [\text{low}+\text{back}] \rightarrow \]
A subtractive approach

RAISING AS REDUCTION

Open-syllable raising changes /æ/ and /ɑ/ from low to high, and removes their specifications for [±back]:

\[ \text{æ} \]
\[ +\text{low} \]
\[ -\text{back} \]

\[ \text{ɑ} \]
\[ +\text{low} \]
\[ +\text{back} \]

(Underlying /i/ also has [±round], but we can assume that this is the default realization of vowels not specified for [±round].)
Open-syllable raising changes /æ/ and /ɑ/ from low to high, and removes their specifications for [±back]:

\[
\begin{align*}
\text{æ} & \quad \begin{cases} +\text{low} \\ -\text{back} \end{cases} \\
\text{i} & \quad \begin{cases} -\text{low} \\ +\text{high} \end{cases}
\end{cases}
\]

\[
\begin{align*}
\text{ɑ} & \quad \begin{cases} +\text{low} \\ +\text{back} \end{cases}
\end{cases}
\]
A subtractive approach

RAISING AS REDUCTION

- Open-syllable raising changes /æ/ and /ɑ/ from low to high, and removes their specifications for [+back]:

  æ
  [+low  
  −back] → i
  [−low  
  +high]

  α
  [+low  
  +back]

- (Underlying /i/ also has [−round], but we can assume that this is the default realization of vowels not specified for [±round].)
In the additive approach, operations must be able to:

- see both contrastive and redundant features
- distinguish between them by referring to constraints on the inventory.

In the subtractive approach, redundant features just aren't there. The contrastive hierarchy allows for cross-linguistic variation in feature scope, but languages don't need to keep referring to their hierarchies to remember what's contrastive.
Conclusions

- In the additive approach, operations must be able to:
  - see both contrastive and redundant features
Conclusions

In the additive approach, operations must be able to:

- see both contrastive and redundant features
- and distinguish between them
In the additive approach, operations must be able to:
- see both contrastive and redundant features
- and distinguish between them
- by referring to constraints on the inventory.
Conclusions

In the additive approach, operations must be able to:
- see both contrastive and redundant features
- and distinguish between them
- by referring to constraints on the inventory.

In the subtractive approach, redundant features just aren’t there.
In the additive approach, operations must be able to:

- see both contrastive and redundant features
- and distinguish between them
- by referring to constraints on the inventory.

In the subtractive approach, redundant features just aren’t there.

The contrastive hierarchy allows for cross-linguistic variation in feature scope, but languages don’t need to keep referring to their hierarchies to remember what’s contrastive.
Reiss (2017: 29) on the additive approach:
Reiss (2017: 29) on the additive approach:

…this kind of systemic sensitivity [to contrast] forces the rule component to have access to the segment inventory in the lexicon and to contain a separate module to determine which features are contrastive in a given context.
Reiss (2017: 29) on the additive approach:

…this kind of systemic sensitivity [to contrast] forces the rule component to have access to the segment inventory in the lexicon and to contain a separate module to determine which features are contrastive in a given context.

The subtractive approach doesn’t need this
Reiss (2017: 29) on the additive approach:

…this kind of systemic sensitivity [to contrast] forces the rule component to have access to the segment inventory in the lexicon and to contain a separate module to determine which features are contrastive in a given context.

The subtractive approach doesn’t need this

We do need a (one-time) procedure to assign language-particular featural representations to underlying segments.
Conclusions

Reiss (2017: 29) on the additive approach:

…this kind of systemic sensitivity [to contrast] forces the rule component to have access to the segment inventory in the lexicon and to contain a separate module to determine which features are contrastive in a given context.

The subtractive approach doesn’t need this.

We do need a (one-time) procedure to assign language-particular featural representations to underlying segments.

And we need something like that in any case if we have anything other than full specification of a UG-provided set of features—e.g., if we want to say that /v/ is specified as [+voice] in some languages, but unspecified for voicing in Russian and Hungarian.
Köszönöm!

Bármiféle kérdés?
References


References


Padgett, Jaye. 2002. Russian voicing assimilation, final devoicing, and the problem of [v] (or, the mouse that squeaked). Ms., University of California, Santa Cruz. ROA #528.

