Today's topics:

- **Syllable-structure assignment**
- **Motivating constraint-based phonology**

Background preparation:

(none)

0. Today's objectives

After today's class, you should be able to:

- Explain what we need to add to our phonological **model** concerning **syllable structure**

- Distinguish a phonological **representation** from a phonological **process**, and give examples of each

- Identify and discuss **problems** that arise when modeling **processes** in a **rule-based** model

We will also preview basic principles of **Optimality Theory** as a **constraint-based** model of grammar

1. Syllable structure: What to model

- What are aspects of syllable structure that we need to include in our **phonological model**, in some way?

1. Syllable structure: What to model

- What are aspects of syllable structure that we need to include in our **phonological model**, in some way?

  - Segments belong to **syllables**

  - Syllables consist of **onset**, **nucleus**, **coda**

  - There are several **implicational relationships** among syllable types (CV, CVC, V, VC)

  - Syllable structure in a given language is **predictable** based on segment classes

  - Some languages have **weight** distinctions

  - Syllable positions can be subject to **restrictions**

2. Representations vs. processes

- Our model of the phonological grammar has two main components

  - A model of **phonological representations**
    - **Which entities** should our model include?
    - How are these entities **encoded**?

  - A model of **phonological processes**
    - What does the grammar need to **do**?
    - How does it **manipulate** the phonological representations to achieve this?

2. Representations vs. processes

- Our model has two main components

  - A model of **phonological representations**
    - **Which entities** should our model include?
    - How are these entities **encoded**?

  - How have we answered these questions for the **representation** of segments and segment classes?

2. Representations vs. processes

- How does Zec's (2007) model formally **represent** the following aspects of syllable structure?

    - The **relationship** between segments, syllables

    - Syllable **weight** distinctions

    - The syllable **nucleus**
        - Is it predictable which segment is the nucleus?

    - **Onset** vs. **coda**

    - The **levels** of sonority

2. Representations vs. processes

- Our model has two main components
  - A model of **phonological representations**
  - A model of **phonological processes**
    - What does the grammar need to **do**?
    - How does it **manipulate** the phonological representations to achieve this?

  - How have we answered these questions for **processes** involving segments and segment classes?

3. Processes enforcing syllable structure

- Questions:

  - In a given language, is syllable structure predictable or unpredictable?

  - Do all languages allow the same kinds of syllable structures?

  - What are the implications of these two questions for syllable-structure-related **processes** in our phonological model?

3. Processes enforcing syllable structure

- If the grammar **enforces predictable patterns**, how does it account for…

  - Associating segments with syllables and moras?

  - Enforcing limits on possible syllable shapes?

  - Epenthesis, deletion, and syllabicity alternations that depend on (im)possible syllable shapes?

3. Processes enforcing syllable structure

Examples

- How can a **rule-based** phonological grammar…

    - Account for predictable syllable/mora structure in each individual language?

        - Try: English *fill* vs. *filling* (dark~light /l/)

3. Processes enforcing syllable structure

- How can a **rule-based** phonological grammar...

  - Require that every syllable has a nucleus?

  - Account for the universal onset status of ...V.**C**V ?

3. Processes enforcing syllable structure

- Data set - [Cairene Arabic](#)

  - How can the grammar enforce the process (presence and location) of epenthesis?

- Data set - [Swahili](#)

  - How can the grammar account for alternations in the prefix [w]~[u] (with reference to syllable structure)?

  - Is [±syll] predictable?

3. Processes enforcing syllable structure

- Data set - [Child phonology](#)

  - How do the **surface forms** produced by children differ from adult forms?

    - Are they simpler or more complex?

  - In a rule-based model of phonology, how does a child's **grammar** differ from the adult grammar?

    - Is it simpler or more complex?

4. Conspiracies

- Data set - Rio Grande Valley Spanish

  - What alternations do we see here?

  - What rules would we need to account for the alternations?

  - What relationship do these rules have to each other?

4. Conspiracies

- **Conspiracy**: Multiple rules with the same "target"

    - How insightful is it to write multiple distinct rules that "happen" to have the same goal?

    - Does the formal model directly express that goal, or is it only in the phonologist's head?

5. A general theory of rules — ??

- A rule-based model of the phonological grammar is useful for **describing** human language

    - Rules are a **clear and convenient summary** of what happens when the phonological grammar makes something happen: A → B / C _ D

    - Rules use an **explicit formalism**, which is good because it means that we, as linguists, have to be precise about what phenomenon we are trying to describe

5. A general theory of rules — ??

- However: A rule-based phonological model is less successful at **predicting** and **explaining**

    - We would want to develop a **general theory** of what kinds of phonological rules can occur in the languages of the world / in the human mental grammar

    - It has been difficult to find cross-linguistic patterns in phonological rules

5. A general theory of rules — ??

- From Prince & Smolensky (1993/2004):

4   *Chapter 1*   *Prince & Smolensky*

1.2 Optimality

The standard phonological rule aims to encode grammatical generalizations in this format:

(1) $A \rightarrow B \ / \ C—D$

The rule scans potential inputs for structures CAD and performs the change on them that is explicitly spelled out in the rule: the unit denoted by A takes on property B. For this format to be worth pursuing, there must be an interesting theory which defines the class of possible predicates CAD (Structural Descriptions) and another theory which defines the class of possible operations $A \rightarrow B$ (Structural Changes). If these theories are loose and uninformative, as indeed they have proved to be in reality, we must entertain one of two conclusions:

     (i) phonology itself simply doesn't have much content, is mostly 'periphery' rather than 'core', is just a technique for data-compression, with aspirations to depth subverted by the inevitable idiosyncrasies of history and lexicon; or

     (ii) the locus of explanatory action is elsewhere.

We suspect the latter.

5. A general theory of rules — ??

- How does a rule-based model **enforce predictable information**?

    - Predictable aspects of URs (default allophones)

    - Predictable segment distribution

    - Predictable syllable structure

5. A general theory of rules — ??

How does a rule-based model **enforce predictable information**?

- **Morpheme-structure constraints** account for predictable aspects of URs

  - Example: Some rule-based approaches propose that URs must contain only the *default representation* of each phoneme

5. A general theory of rules — ??

How does a rule-based model **enforce predictable information**?

- **Segmental rules** operate on URs and change them into the appropriate SRs based on environment

    - Specific allophones

    - Morpheme alternations

5. A general theory of rules — ??

How does a rule-based model **enforce predictable information**?

- **Syllable-building rules** take a string of segments and assign syllable structure

    - However, syllable-building rules are unlike segmental rules: they are often seen to **reapply** multiple times after insertion or deletion rules have applied

5. A general theory of rules — ??

- Conclusion: Our rule-based phonological model **does not have one consistent approach** to enforcing predictable information

6. An alternative to phonological rules

Classical **Optimality Theory**: Basic principles

- It is the **targets/goals**, rather than the rules that are used to achieve them, that are the basic elements of our model of phonological processes

  - Targets/goals are formalized as **constraints**
    - A constraint assigns a **penalty** to any **output candidate** (potential output form) that violates it

  - Strong hypothesis: Constraints are **universal**
    - All constraints are found in all languages

6. An alternative to phonological rules

- If constraints are universal, why do languages differ?

    - Languages **rank** the constraints differently

    - Constraints are **violable** (can be violated)

    - A constraint will be violated when necessary to satisfy a **higher-ranked** constraint

    - The output candidate that **best satisfies the hierarchy of ranked constraints** wins

- Since different **languages** have different constraint **rankings**, different **output candidates** may win

6. An alternative to phonological rules

- Questions we need to address:

  - What is a possible **constraint**?

  - What is a possible **output candidate**?

  - What are **inputs** like?

  - How do constraints **interact**?

  - How do we **do phonological analysis** in OT?
    - For a given constraint hierarchy and input, how do we **find the winning output**?
    - For a given input and output, how do we **determine the constraint ranking**?

References

Prince, Alan, and Paul Smolensky. 2004. *Optimality Theory: Constraint Interaction in Generative Grammar.* Oxford: Blackwell. [Originally distributed as a RUCCS technical report, Rutgers U., 1993; available as ROA-537.]