Psych 156A/ Ling 150: Acquisition of Language II

Lecture 14
Introduction to Language Structure

Announcements

Please pick up your previous assignments if you have not already done so

Homework 3 due

Review questions available for structure

Computational Problem:
Figure out the order of words (syntax)

Jareth juggles crystals
Subject Verb Object
Noun Verb Noun
NP NP

Depends on grammatical categories like Nouns and Verbs (and their associated phrases (NP)), but also on more precise distinctions like Subjects and Objects.

Some Noun Phrase distinctions:
Subject = usually the agent/actor of the action, “doer”: Jareth
Object = usually the recipient of the action, “done to”: crystals

Important idea: The observable word order speakers produce (like Subject Object Verb) is the result of a system of word order rules that speakers unconsciously use when they speak. This system of word order rules is called syntax.
Computational Problem: Figure out the order of words (syntax)

Jareth juggles crystals
Subject Verb Object

One way to generate Subject Verb Object order:
The linguistic system specifies that order as the general pattern of the language. An example of this kind of system is English.

English Subject Verb Object

Another way to generate Subject Verb Object order:
The linguistic system specifies Subject Object Verb as the general pattern, but the Verb in main clauses moves to the second position and some other phrase (like the Subject) moves to the first position. An example language like this is German.

German Subject Object Verb

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Subject Verb Object

A third way to generate Subject Verb Object order:
The linguistic system specifies Subject Object Verb as the general pattern, but the Object moves after the Verb in certain contexts (the Object is unexpected information). Kannada is a language like this.

Kannada Subject Object Verb

Computational Problem: Figure out the order of words (syntax)

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Kannada Subject Object Verb

Computational Problem: Figure out the order of words (syntax)

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Subject Verb Object

The learning problem: How do children know which system their language uses?

English Subject Verb Object

German Subject Verb Object

Kannada Subject Object Verb

Computational Problem: Figure out the order of words (syntax)

Jareth juggles crystals

Subject Verb Object

This is a hard question!
Children only see the output of the system (the observable word order of Subject Verb Object).
Humans are good at language - how good are computers?

Translation is not so easy: more than just word-by-word

Word-by-word translation to Japanese is poor. Japanese structure is very different from English structure at this level.
Translation is not so easy: more than just word-by-word


Translation is not as poor. Russian structure is not as different from English structure at this level, though it is still different.

The translation is fairly poor. Arabic structure is fairly different from English structure at this level.
Solving the Language Problem (Artificial Intelligence)

HAL 9000 from 2001: A Space Odyssey (1968)
Perfect production and comprehension of English.

1960s: Language not considered one of the “hard” problems of artificial intelligence.


Contrast: Chess-playing. In 1997, a program named Deep Blue beat the reigning world champion in chess. It did this by having enough computational resources to investigate every move option before it actually made the chess move. This shows that computers’ poor performance on language is not about insufficient computational power, since there is enough computational power to solve the chess-playing problem (which some people might consider a very difficult problem).

Navajo Code Talker Paradox (Baker 2001)

English must be very different from Navajo
Japanese could decode English, but couldn’t decode Navajo when they didn’t know it was Navajo.

English must be similar to Navajo
English can be translated into Navajo and back with no loss of meaning. (Languages are not just a product of the culture - pastoral Arizona lifestyle couldn’t have prepared the code talkers for Pacific Island high tech warfare. Yet, translation was still possible.)
Types of Variation

Vocabulary

English “think” verbs: think, know, wonder, suppose, assume, ...

Multiple types of the action verb “think”. Each has certain uses that are appropriate.

“I wonder whether the girl saved her little brother from the goblins.” [grammatical]

* “I suppose whether the girl saved her little brother from the goblins.” [ungrammatical]

Types of Variation

Sounds: Each language uses a particular subset of the sounds in the International Phonetic Alphabet, which represents all the sounds used in all human languages. There’s often overlap (ex: “m”, “p” are used in many languages), but languages also may make use of the less common sounds.

less common English sounds: “th” [θ], “th” [ð]

less common Navajo sounds: “whispered l”, “nasalized a”, ...

Types of Variation

Morphology (word forms)

English: invariant word forms

“the girl is crying”, “I am crying”

Navajo: no invariant forms (there may be 100-200 prefixes for verb stems)

At’éd yicha. “Girl crying”

Yishcha. “I am crying”

(yi + sh + cha)

Ninááhișdlaad. “I am again plowing”

(ní + náá + ho + hi + sh + í + dlaad)
Types of Variation

Word order (syntax)

- **English**: Subject Verb Object (invariant word order)
  - "The boy saw the girl"

- **Navajo**: Subject Object Verb, Object Subject Verb (varying word orders, meaning depends only on verb's form)
  - Ashkii at'eedééhviiltsá
    - boy girl saw
    - "The boy saw the girl"
  - Ashkii at'eedééhvilsta
    - boy girl saw
    - "The girl saw the boy"

Thinking About Syntactic Variation

Similarities & Differences: Parameters

Chomsky: Different combinations of different basic elements (parameters) would yield the observable languages (similar to the way different combinations of different basic elements in chemistry yield many different-seeming substances).

Big Idea: A relatively small number of syntax parameters yields a large number of different languages’ syntactic systems.
Chomsky: Different combinations of different basic elements (parameters) would yield the observable languages (similar to the way different combinations of different basic elements in chemistry yield many different-seeming substances).

Big Idea: A relatively small number of syntax parameters yields a large number of different languages’ syntactic systems.

Total languages that can be represented = \(2^5 = 32\)
Chomsky: Children are born knowing the parameters of variation. This is part of Universal Grammar. Input from the native linguistic environment determines what values these parameters should have.
Generalizations About Language Structure

Greenberg's Word Order Generalizations

Navajo
- Basic word order: Subject Object Verb
  - 'ééd bínáádzi'é
  - boy girl saw
  - "The boy saw the girl"

Japanese
- Basic word order: Subject Object Verb
  - Hoggle-o butta Jareth-ga
  - hit saw Jareth
  - "Jareth hit Hoggle"

Navajo
- Postpositions:
  - 'ééd bínáádzi'é
  - clothing into I-got-back
  - "I got back into (my) clothes."

Japanese
- Postpositions:
  - Jareth-ga Sarah to kuruma da
  - Jareth Sarah with car by
  - London ni ilta
  - "Jareth went to London with Sarah by car."
Despite the differences in the languages (and their cultural histories), both Japanese and Navajo are very similar when viewed through these three structural descriptions.
### Greenberg's Word Order Generalizations

<table>
<thead>
<tr>
<th>Prepositions:</th>
<th>Preposition Noun Phrase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jareth gave the crystal to Sarah</td>
<td>Ozo gave the book to Adesuwa</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Possessed before Possessor</th>
<th>Possession</th>
<th>Possessor</th>
</tr>
</thead>
<tbody>
<tr>
<td>quest of Sarah (alternative: Sarah's quest)</td>
<td>Ozo</td>
<td>Ozo child</td>
</tr>
</tbody>
</table>

Again, despite the differences in the languages (and their cultural histories), both English and Edo are very similar when viewed through these three structural descriptions.
### More Language Comparisons

#### French vs. Italian

<table>
<thead>
<tr>
<th>Subject</th>
<th>Verb</th>
<th>Subject</th>
<th>Verb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jareth</td>
<td>arrivera</td>
<td>Jareth</td>
<td>verrà</td>
</tr>
<tr>
<td>&quot;Jareth will come.&quot;</td>
<td>&quot;Jareth will come.&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<tbody>
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<td><em>Arrivera</em></td>
<td>Jareth</td>
<td><em>Verrà</em></td>
<td><em>He-will-come</em></td>
</tr>
<tr>
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<tr>
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<td>Jareth</td>
<td><em>Verrà</em></td>
<td><em>He-will-come</em></td>
</tr>
<tr>
<td>&quot;Jareth will arrive&quot;</td>
<td>&quot;Jareth will arrive&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These word order patterns might be fairly easy to notice. They involve the combinations of Subject and Verb that are grammatical in the language. A child might be able to notice the prevalence of some patterns and the absence of others.
### More Language Comparisons

#### Expletive subjects: words without content (may be more difficult to notice)

<table>
<thead>
<tr>
<th>French</th>
<th>Italian</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pleut</em></td>
<td>Piove</td>
</tr>
<tr>
<td>It-rains.</td>
<td>It-rains.</td>
</tr>
<tr>
<td>&quot;It's raining.&quot;</td>
<td>&quot;It's raining.&quot;</td>
</tr>
<tr>
<td>Il pleut.</td>
<td>Piove.</td>
</tr>
<tr>
<td>It rains.</td>
<td>&quot;It's raining.&quot;</td>
</tr>
<tr>
<td>&quot;It's raining.&quot;</td>
<td>&quot;It's raining.&quot;</td>
</tr>
</tbody>
</table>

Not okay to leave out expletive subject "it".

### More Language Comparisons

#### Embedded Subject-Question Formation (easy to miss)

<table>
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<th>French</th>
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<tbody>
<tr>
<td>Tu veux que Marie épouse Jay.</td>
<td>You want that Marie marries Jay.</td>
</tr>
<tr>
<td>*Qui veux-tu que ___ épouse Jay?</td>
<td>&quot;You want Marie to marry Jay.&quot;</td>
</tr>
<tr>
<td>Que veux-tu qui ___ épouse Jay?</td>
<td>&quot;Who want-you that marries Jay?&quot;</td>
</tr>
<tr>
<td>*Who do you want to marry Jay?&quot;</td>
<td></td>
</tr>
<tr>
<td>Requires a special &quot;that&quot; form: qui.</td>
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### More Language Comparisons

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<tr>
<td>Credi che Jareth verrá.</td>
<td>You think that Jareth will-come.</td>
</tr>
<tr>
<td><em>Che credi che ___ verrá?</em></td>
<td>&quot;You think that Jareth will come.&quot;</td>
</tr>
<tr>
<td>Who think-you that will-come?</td>
<td>&quot;Who do you think will come?&quot;</td>
</tr>
<tr>
<td>Does not require a special &quot;that&quot; form: use the same one as normally is used - che.</td>
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### More Language Comparisons

#### Italian Subject Verb

<table>
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<tr>
<td><em>Verb</em></td>
<td><em>Verb</em></td>
</tr>
<tr>
<td>Not okay to leave out expletive subject &quot;it&quot;. Requires special action for embedded subject questions.</td>
<td></td>
</tr>
</tbody>
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All these involve the subject in some way - coincidence? Idea: No! There's a language parameter involving the subject.
The Value of Parameters: Learning the Hard Stuff by Noticing the Easy Patterns

French vs. Italian: Subject Parameter

French

Subject Verb
Verb Subject
*Verb
It-rains.
I pleut.

Italian

Subject Verb
Verb Subject
*Verb
Expletives
Pieve.
It-rains.

Embedded Subject-question formation (easy to miss)

*Qui veux-tu que ___ épouse Jean?
Who want-you that ___ marries Jean?

Que veux-tu qui ___ épouse Jean?
Who think-you that ___ will-come?

Big idea: If all these structural patterns are generated from the same linguistic parameter (e.g., a "subject" parameter), then children can learn the hard-to-notice patterns (like the patterns of embedded subject questions) by being exposed to the easy-to-notice patterns (like the optional use of subjects with verbs). The hard-to-notice patterns are generated by one setting of the parameter, which children can learn from the easy-to-notice patterns.

Children’s knowledge of language structure variation is believed by nativists to be part of Universal Grammar, which children are born with.

Universal Grammar: Principles & Parameters

Principles: Apply to all human languages.
Ex: Language has hierarchical structure.
Smaller units are chunked into larger units.

sounds g a b l i n
syllables g a b l i n
words goblin
phrases Noun Phrase (NP) Verb Phrase (VP) The sneaky goblin stole the baby
sentences The sneaky goblin stole the baby

Parameters: Constrained variation across languages. Children must learn which option their native language uses.

Japanese/Navajo

Basic word order:
Subject Object Verb
Postpositions:
Noun Phrase Postposition
Possessor before Possessed Possession

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Subject Verb Object
Prepositions:
Preposition Noun Phrase
Possessed before Possessor
Possession Possessor

Japanese/Navajo

At this level of structural analysis (parameters), languages differ very minimally from each other. This makes language structure much easier for children to learn. All they need to do is set the right parameters for their language, based on the data that are easy to observe.

Language Variation: Summary

While languages may differ on many levels, they have many similarities at the level of language structure (syntax). Even languages with no shared history seem to share similar structural patterns.

One way for children to learn the complex structures of their language is to have them already be aware of the ways in which human languages can vary. Nativists believe this is knowledge contained in Universal Grammar. Then, children listen to their native language data to decide which patterns their native language follows.

Languages can be thought to vary structurally on a number of linguistic parameters. One purpose of parameters is to explain how children learn some hard-to-notice structural properties.

Questions?

Be working on review questions