Grouping Words into Phrases (Syntax II)

Motivation: A sentence is more than a string of words

(1) a. *I saw a man with a telescope.*
b. *I told you I would go to the party on Tuesday.*
c. *We need more intelligent leaders.*
d. *Old men and women are exempt from the new tax.*
e. *L.A. Voters Approve Urban Renewal by Landslide.*
f. *Eye Drops off Shelf*
g. *Killer Sentenced to Die for Second Time in 10 Years*

Describing Noun Phrases

In English, a noun phrase can consist of: a determiner followed by a noun, or a determiner followed by an adjective followed by a noun, or a single plural noun, or . . .

To save words, we can use *Phrase Structure Rules* to express this:

(2)

a.	*NP* → *Det N*	the cat
b.	*NP* → *Det A N*	those noisy cats
c.	*NP* → *N*	cats
d.	*NP* → *A N*	noisy cats

We can mark optional subphrases with parentheses and express this even more compactly:

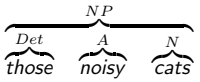
(3) *NP* → *(Det) (A) N* cats, noisy cats, the cat, those noisy cats

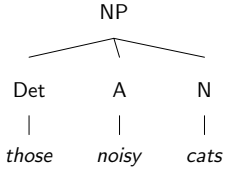
More on Phrase Structure Rules

The phrase structure rule "NP → (Det) (A) N" specifies two things:

- Which smaller units (Det, A, N) are used to build a phrase (NP).
- How to order the smaller units – the rule (3) allows *noisy cats*, but not *cats noisy*.

We can graphically represent the grouping of words and phrases:





More Motivation for Grouping Words and Phrase Structure

In Atepec Zapotec, a native language of Northern Oaxaca, Mexico with 4000 speakers, one can form the sentence in (4).

(4) *betti kontrariu zheni animal a*
killed enemy big animal that

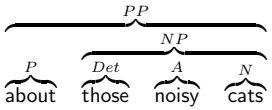
1. Guess the meaning of this sentence, based on the word by word translation.
2. How can one represent the relevant grouping?

Describing Prepositional Phrases

In English, a preposition is usually followed by a noun phrase:

(5) *PP → P NP* about those noisy cats

Together with the rules for NP, we can now generate:

(6)


Describing Sentences

In English, a sentence consists of a subject (usually a noun phrase) followed by a verb which is sometimes followed by an object (another noun phrase), prepositional phrases etc.

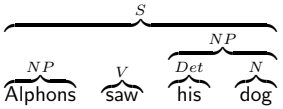
(7) a. Alphons slept. – *Subject + V*
b. Alphons saw his dog. – *Subject + V + Object*
c. Alphons asked for a beer.
d. Alphons asked his dog for a beer.

(8) a. *S → NP V* – Alphons slept
b. *S → NP V NP* – Alphons saw his dog
c. *S → NP V PP* – Alphons asked for a beer
d. *S → NP V NP PP* – Alphons asked his dog for a beer

We can abbreviate these rules as:

(9) *S → NP V (NP) (PP)*

The rule S → NP V (NP) (PP) states: A sentence is a noun phrase followed by a verb and possibly some other noun phrase and/or prepositional phrase. For example:

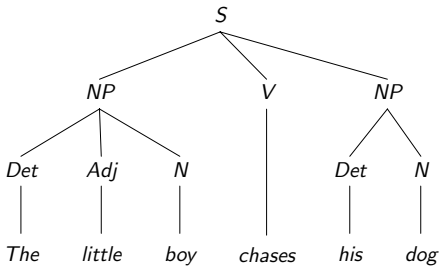
(10)


Of course, there are many other types of English sentences, such as:

(11) a. *S → NP V NP NP* – Alphons offered his dog some beer
b. *S → NP V PP PP* – Alphons argued with his dog about beer
c. *S → NP V NP InfP* – Alphons persuaded his dog to buy some beer
d. *S → NP V NP that S* – Alphons persuaded his dog that it would be wise to bring beer

Linguists often distinguish between sentences and verb phrases (VP). A verb phrase is a sentence without a subject (e.g., *saw his dog*). Then you have to describe sentence in two steps: First, S → NP VP and then VP → V (NP) (PP).

More on Tree Representation

(12)


A tree diagram represents several aspects of "how words are put together" in a sentence:

- order of the words in a sentence.
- word class (Part of Speech) of each word.
- hierarchical structure of a sentence – the grouping of words/phrases into larger phrases
- centers of phrases that other words group around (e.g., N in NP, V in S)

Ambiguity

Some expressions have more than one possible interpretation. This is called ambiguity:

Syntactic Ambiguity – more than one possible structure for the same string of words.

Examples:
(13) *I saw a man with a telescope.* (Who has the telescope, me or the man?)
(14) *We need more intelligent leaders.* (Do we *need more* or *more intelligent* leaders?)

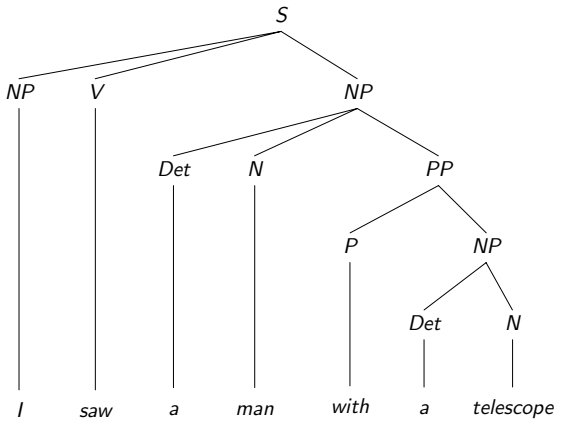
Lexical Ambiguity (homonymity) – a particular word has more than one meaning.

Example: *You brought a bat for show-and-tell?* (an animal or a baseball bat?)

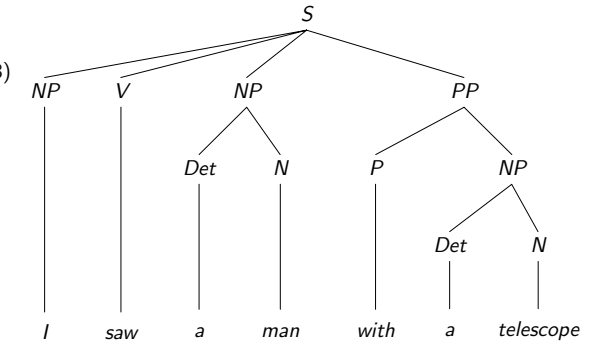
Examples from news headlines:
(15) *March planned for next April*
(16) *Iraqi Head Seeks Arms*

Example for Syntactic Ambiguity

(17)



(18)



Another example:

(19) *Old men and women are exempt from the new tax.*

Resolving ambiguities

Sometimes, world knowledge can help you to select the right interpretation:

(20) a. *I saw a policeman with a gun.*
b. *I saw a dog with a telescope.*

Syntactically, these examples are ambiguous, however your knowledge of the world helps you to choose the most probable interpretation.

Characteristics of Phrase Structure Rules

(21) a. *S* → *NP V (NP) (PP)*
b. *NP* → *(Det) (A) N (PP)*
c. *PP* → *P NP*

This small grammar describes a small subset of English. It has several characteristics, which it shares with grammars of real languages:

- **Generativity**:
  It does not *list* the sentences of the language, it describes the way *how to build* them. This is important, since a language contains an infinite number of sentences.
- **Ambiguity**:
  Some sentences can be build in more than one way. These sentences are syntactically ambiguous (for example the *telescope* sentence above). This also shows that sentences are more than just simple strings of words.
- **Recursion**:
  An unlimited number of sentences can be built using a small, fixed number of rules.

Recursion

Recursion can be thought of as a process of "looping back" or "feeding oneself", which makes it possible for a finite number of rules to produce any number of sentences.

One example of recursion in English involves the pair of rules (21b) and (21c):
(21b) NP → (Det) (A) N (PP)
(21c) PP → P NP

1. The rule (21b) licenses a PP.
2. This PP is described by the rule (21c), which requires an NP.
3. This NP is again described by rule (21b), which again allows a PP.
4. This PP is described by the rule (21c), which requires an NP.
5. . . .

The two rules taken together generate many phrases including:
(22) *The book on the shelf in the corner in the bedroom of my house in LA.*

(23)