Phrase Structure Rules

The main objective of the course is to understand the tacit/innate knowledge that accounts for the speaker's knowledge of what counts as a sentence.

We know that as per this knowledge, a sentence is not merely a linear string, but has a hierarchical structure that we have represented by means of a tree-diagram

The next best thing for us to explain as to what makes a tree-diagram as a legitimate tree-diagram in a given language.

Formally, a theory consists of a number of concepts and principles or general statements made in terms of those concepts.

We have adopted the concepts that are involved in a labeled tree diagram to represent speakers' knowledge of sentence structure.

To seek a general theory about possible sentence structures in language, let's start with a formal definition of some concepts involved in a tree.

Let me show you something interesting and talk about the concept and the knowledge about the tree-diagram:

(1)
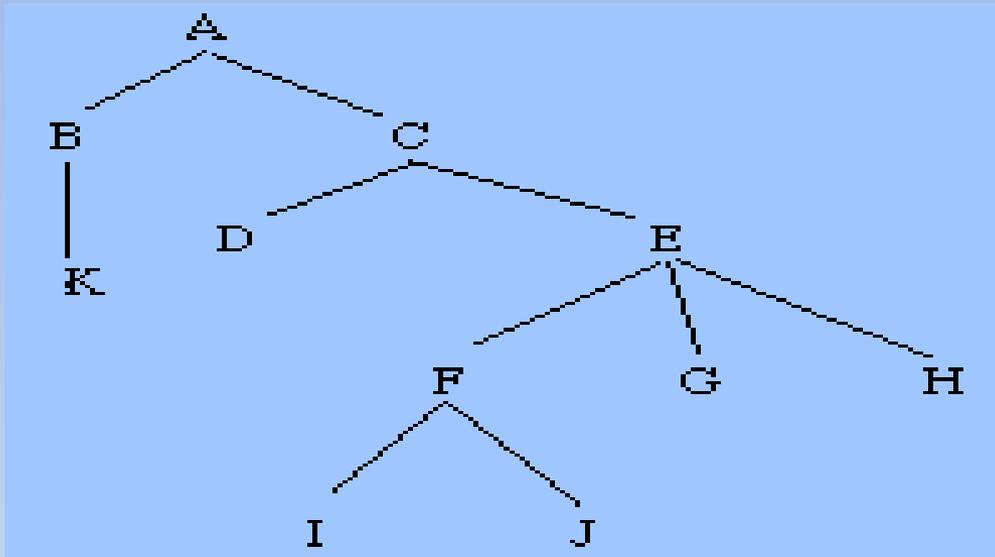
A tree consists of nodes and branches. Each tree has a root node and one or more terminal nodes.

In (1), the root node is A, and the terminal nodes are K, D, I, J, G, H. The nodes that are neither root nor terminal nodes will be called intermediate nodes.

Nodes are connected, directly or indirectly, by branches.

A tree diagram is sometimes called a phrase-marker, or P-marker. A P-marker encodes two sorts of relations between nodes: (a) precedence and (b) dominance.

X precedes Y iff [if and only if] X and Y are linearly arranged and X appears to the left of Y.

In (1), K precedes D, I, J, G, and H; J precedes G, H, but follows K, D, I.

The relation of dominance is that of containment. X dominates Y iff X contains Y, or iff Y is contained in X. ["Contains Y" means "has Y as (one of) its parts".

In (1), A dominates all the other nodes in the tree. C dominates D, E, and all nodes that E dominates (F, I, J, G, H) but it does not dominates B, K, or A.

Similarly, F dominates I and J, but does not dominate any other nodes.

And the terminal nodes dominate nothing other than their own-selves. Hence, precedence is a linear relation, and dominance is a hierarchical relation.

 Two nodes are in either a hierarchical (dominance) relation or in a linear (precedence) relation, but not both.

Thus, B and C are in a precedence relation (B precedes C), but not in a dominance relation. On the other hand, E dominates G, but neither precedes or f ollows the other.

X immediately dominates Y iff X is the lowest node that dominates Y. (There is no intervening Z such that Z dominates Y and is dominated by X.)

In (1), A dominates all other nodes, but it only immediately dominates B and C. Similarly, E dominates F, G, H, and I, J, but it does not immediately dominate I or J.

Where X dominates Y, we say that Y is a constituent of X. Y is an immediate constituent of X iff X immediately dominates Y. In (1), all the non-root nodes are constituents of A, but only the nodes B, C are A's immediate constituents.

I is a constituent of F, it is also a constituent of E, of C, and of A; but it is only an immediate constituent of F, but not an immediate constituent of E, C, or A.

The structural relations under consideration are sometimes referred to in kinship terms. Thus X is the mother of Y iff X immediately dominates Y (in this case, Y is the daughter of X).

Hence, the "daughter of" relation is equivalent to the relation "immediate constituent of".

X, Y are sister nodes of each other iff they have the same mother (e.g., are the immediate constituents of the same mother node).

Phrase Structure Rules for English (i.e. PS-rules)

1. Sentence:

In general, English sentences may contain an NP (as the subject) and a VP (as the predicate), and an optional auxiliary, as illustrated in examples given below:

(2) a. John cried.

    b. [The professor] [pointed out a mistake in his argument].

    c. [They] [could] [see the point immediately].

So, a PS-rule in English for a sentence (will be revised soon ☹) is

- The Sentence Rule
- **S → NP (Aux) VP -------------------------------- (PSR1)**

2. The Noun Phrase

We can further state generalizations about what constituents an NP, VP, or Aux may contain. For example, an NP may take the 'bare form' of a noun, or it may contain a noun and an optional determiner and an adjectival phrase.

(3) a. John/Boys like(s) basketball games.

b. The boys like basketball games.

c. Tall boys like basketball games.

d. The tall boys like basketball games.

This generalization can be stated in the form of a rule like (3a):

(2a) NP -----> (Det) (AP) N

In addition to prenominal modifiers, an NP can optionally take post-nominal modifiers as well, such as:

(4)   a. Boys from this school like basketball most.

   b. Boys who are tall tend to like basketball most.

   c. Boys from this school who are tall tend to like basketball most.

We can state this generalization by the following rule:

(2a.1) NP → N (PP) (S')

The concept of 'bar' in syntax is very simple and very important. This is as we have talked about 'word-part' in our Morphology class which is anything that is lesser than a 'word' in its status.

So, if a ['] → 'bar' is placed on S= sentence node, it **(S')** which can be replaced with anything that is smaller than a sentence, i.e. a clause (in terms of traditional grammar approach).

In fact, an NP may have both prenominal and post-nominal elements in addition to the noun:

(5) a. The king of England had an unhappy life.
b. The young king of England had an unhappy life.
c. The young king who gave up his throne had an unhappy life.
d. The king of England who gave up his throne had an unhappy life.

So, we need to put all these together and by collapsing earlier rules for an NP, we can have the following rule to capture more generalization.

(2a.2) NP → (Det) (AP) N (PP) (S')

This rule says that an NP contains an obligatory N, plus a number of optional prenominal or post-nominal elements in the order given.

Finally, any of the NPs illustrated in some of the earlier examples may just take a single personal pronoun:

(6) a. They like basketball games.

　　b. He had an unhappy life.

This means that a pronoun substitutes for [= has the same status as] the whole NP, and not just for a noun. We may express this possibility by the rule (3a.3):

(2a.3) NP -----> Pronoun

In other words, an NP either consists of a noun with possible optional elements, or solely of a pronoun. We can express this choice with a pair of braces:

(2a.4) The NP Rule

$$ NP \longrightarrow \begin{Bmatrix} \text{a. Pronoun} \\ \text{b. (Det) (AP) N (PP) (S)} \end{Bmatrix} \text{-----------------} (PSR2) $$

3. The Verb Phrase

Now let us look at the VP constituent, and consider what counts as a grammatical VP in English. A VP may contain only a verb, as in (25):

(8) a. John died.
    b. That glass of the window broke.
    c. A horrible accident happened.

We can express by this VP rule:

(3) VP → V

However, the verb may occur with an object NP, a prepositional phrase (PP), or a subordinate sentence (S'):

(9) a. John saw Bill. (V NP)
    b. John lived in Irvine. (V PP)
    c. John thought Bill kicked the bucket. (V S')

This means that a VP must have /contain V , but it may optionally occur with an NP, PP or S':

(3a)

$$VP \longrightarrow V \left(\left\{ \begin{matrix} NP \\ PP \\ S \end{matrix} \right\} \right)$$

In fact, for each of these three choices, there is an additional option of an NP preceding the choice:

(10) a. John gave the boy a nice gift. (V NP NP)
    b. John put the book on the table. (V NP PP)
    c. John told the little boy he won a prize. (V NP S)

In other words, a VP always contains a verb, and may in addition have one or two elements following the V. The range of 7 possibilities illustrated in all the examples can be captured by the following rule:

(3a.1) The VP rule:
$$VP \longrightarrow V\ (NP)\ \left(\begin{Bmatrix} NP \\ PP \\ S \end{Bmatrix}\right) \text{-------------------------------- (PSR3)}$$

This rule says that a VP must have a head V, which may be optionally followed by up to two other peripheral elements, in the order given in PS-rule for VP in 3a.1.

Other Phrases

(4) The AP Rule

AP ------> (deg) A

(5) The PP Rule
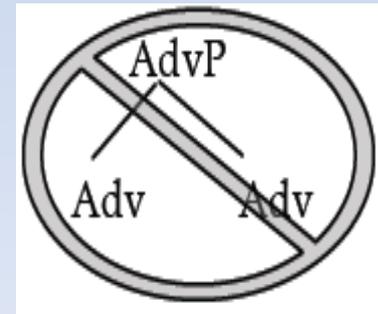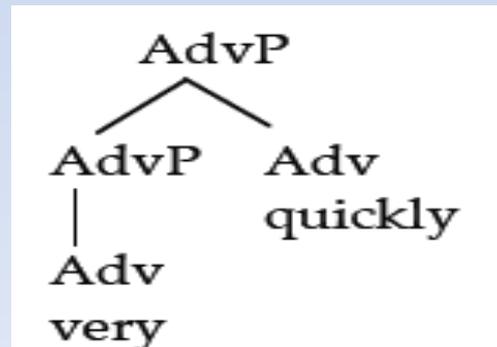
PP -------> P (NP)

(6) The Determiner Rule

Det ------> { Art
               Dem
               NP_Poss }

7. The AdvP Rule

AdvP → Adv(AdvP)

Salient features of Head

a. The grammatical category of head determines the GC of the entire phrase. For example:

1.
  a. very bright [$_N$ **sunflowers**]
  b. [$_V$ **overflowed**] quite quickly
  c. very [$_{Adj}$ bright]
  d. quite [$_{Adv}$ **quickly**]
  e. [$_P$ **inside**] the house

b. The head must have the same 'distribution' as that of the phrase.

What does it mean to say 'distributional properties' of a lexical category?

For example, Noun is a lexical category and it can be the head of a phrase, so what are the distributional properties of a NOUN?