

X-bar Theory

September 16, 2016

Introduction

Linguistic competence and performance

What do we mean when we say that there are infinitely many grammatical (English) sentences? How can we show that this is true?

Isn't it unreasonable to say that arbitrarily long sentences can exist? No-one could possibly produce a sentence with a million or even more words. However, these limitations are posed by factors outside the language faculty (limited memory, attention, lifespan). These belong to linguistic *performance* while our goal is model *competence* only.

In other words, we want to come up with a set of rules that allow native speakers to produce and interpret (decide the grammaticality of) sentences of any length.

Try to show it indirectly: suppose that the longest English sentence is n words long; then, show that this leads to a contradiction.

We are not really concerned about whether a sentence "makes sense" in a stricter way. Cf. Chomsky's famous example *Colorless green ideas sleep furiously*.

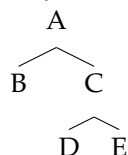
Constituency, phrase structure

What can we say about the structure of the following sentences (with respect to each other)?

- (1) a. Tom chased Jerry.
- b. The cat chased the mouse.
- c. The cat slept.

Think about the distribution of words and groups of words.

Sentences are not just strings of words; they have hierarchical *constituent structure*. That is, words are grouped into phrases which, in turn can be grouped into even larger phrases. The most convenient ways to visualise these are tree diagrams and labelled brackets:



This bracketing describes a structure identical to the one on the left: $[_A B[_C D E]]$

We can also describe how phrases are expanded into further phrases by a set of phrase structure (PS) rules: $A \rightarrow B C$ and $C \rightarrow D E$.

Give phrase structure rules for the sentences in (1). Important restrictions on PS trees:

1. Every node (except the root) has one mother
2. Two branches can never cross each other

The two are completely equivalent, so you can draw a tree if and only if you can create a corresponding labelled bracketing.

To describe the configuration of two elements, we use the following terms: *root*, *leaves*, (*immediately*) *dominates*, *mother/daughter of*, *sister of*. How do these apply to the tree on the left?

For the time being, a naïvely defined list of word categories will suffice; later (next week) we will make this more explicit.

To see why these rules are true, try to come up with PS rules describing the two structures

A more restricted phrase structure

Generalise the form of PS rules by using category variables. This way, we only have to use three rules.

Remember that it is not necessary for a phrase to have specifiers or complements; only the head is always obligatory. Hence, the following phrase is allowed by X-bar theory: $[_{XP}[_{X'} X]]$

1. $XP \rightarrow YP X'$ specifier rule
2. $X' \rightarrow X YP$ complement rule
3. $XP/X' \rightarrow XP/X', YP$
 $X \rightarrow X, Y$ adjunct rule

Notice that XP and X' get the category from X ; the *head* of the phrase. We can also say that bar- and phrase level constituents are *projections* of the head. Hence, we talk about *minimal*, *maximal* and *intermediate projections*.

In X-bar theory, every phrase has a head with a corresponding category; they are *endocentric*.

Also, these rules only allow *binary branching*; that is, a node cannot have more than two daughters. There are two reasons for this:

1. theoretical simplicity (restrictiveness)
2. learnability

Complements

Complements are sisters of the head, and the head can pose restrictions on possible complements. Consider the following:

- (2) a. [_V'look [_{PP} at the picture]]
- b. *_V'look[_{DP} the picture]]
- c. *_V'look[_{VP} watch the picture]]

There's no reason internal to X-bar theory why (2-b) and (2-c) should be wrong; therefore, it must be a property of this particular head and kind of complement.

Specifiers

Generally, we find that specifiers are specific arguments of a predicate, or they have a specific property that relates them to a head. They are not restricted by individual heads. For instance, subjects can be analysed as specifiers, and we find that verbs do not have restrictions on those.

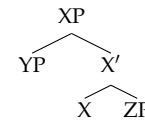
Adjuncts

The adjunct rule has the same element as input and output: it can repeatedly be applied indefinitely. Notice the comma in the rule: the order is not fixed.

Adjunction to non-minimal projections: the adjunct is always a phrase.

- (3) a. [_{N'}[_{AP}popular][_{N'}[_{AP}old][_Nbook]]]
- b. [_{VP}[_{VP}[_{V'}feed the birds][_{AP}tomorrow]][_{PP}in the park]]

Adjunction to the head: only heads can be adjoined to heads forming compound words. In these cases, the adjunction is from left; the



Have we seen any phrases yet that were exocentric?

Words	Bin. bracketing	Any bracketing
2	1	1
3	2	3
5	14	45
7	132	903
10	4862	103049

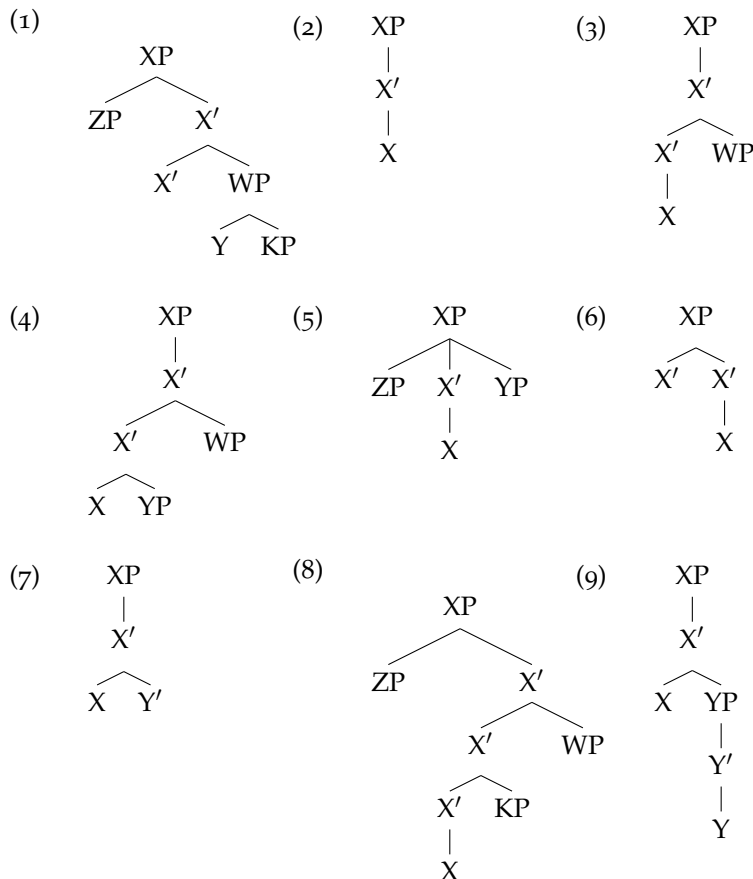
head of the compound (the element determining its category) is on the right.

- (4) a. [N[Ahard]][Ndisk]]
- b. [N[Ncomputer]][N[Ahard]][Ndisk]]

Note that English spelling might not show that a word is a compound. Think about the two interpretations of *drinking chocolate*.

Exercises

1. Decide if the trees are possible X-bar structures. If so, give a labelled bracket representation for them.



2. Study the pairs of sentences, and decide why the second sentences are ungrammatical.

- 1. (a) Julie met the student of Physics from France, and I met the one from Spain.
- (b) *Julie knows the student of Physics from France, and I know the one of English from Spain.
- 2. (a) Julie met a student of Physics of considerable intelligence.
- (b) *Julie met a student of considerable intelligence of Physics.
- 3. (a) Julie met a student of Physics and of Mathematics.
- (b) *Julie met a student of Physics and of considerable intelligence

Reading

X-bar theory: Newson et al. *BESE* 3.1 "X-bar Theory" (pp.87-101)
 Phrase structure in general: Newson et al. *BESE* 2.1 "Structure" (pp.57-68)