

LING419 Homework 4

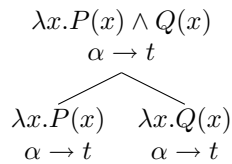
Event semantics and phrase structure

A Event semantics in the H&K system (8 points)

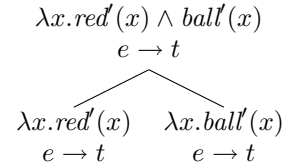
For this part of the homework, we're looking at the H&K-style semantic theory that you used in Homework 3, with one additional rule:

- **Predicate modification (PM)**: If you combine two things which each denote a property (a function of type $\alpha \rightarrow t$, for some type α), the results denotes the conjunction of those two properties: i.e. the property of having both of the two constituent properties.

Recipe:



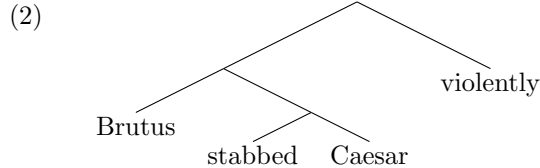
Example:



A simple version

Show how we can associate the string in (1a) with the meaning in (1b), using the tree in (2) and the lexical semantic values in (3).

- (1) a. Brutus stabbed Caesar violently
 b. $\exists e[stabbing'(e) \wedge Agent(e, brutus') \wedge Patient(e, caesar') \wedge violent'(e)]$



- (3) $\llbracket Brutus \rrbracket := brutus'$ $\llbracket stabbed \rrbracket := \lambda x \lambda y \lambda e.[stabbing'(e) \wedge Agent(e, y) \wedge Patient(e, x)]$
 $\llbracket Caesar \rrbracket := caesar'$ $\llbracket violently \rrbracket := \lambda e.violent'(e)$

A revised version

As we have seen, there is strong evidence to suggest that 'stabbed Caesar violently' is a constituent (unfortunate though this is, since the tree in (2) works so nicely). So 'stabbed' must combine with 'Caesar' first, and then with 'violently' next. This means that the constituent 'stabbed Caesar' must be of type $s \rightarrow t$, in

order to combine with ‘violently’, which leads us to the revised meaning for ‘stabbed’ in (4a) below. This can be made to work if we assume that the sentence contains a “silent element” written Θ_{Agent} with the meaning in (4b). Show how.

- (4) a. $\llbracket \text{stabbed} \rrbracket := \lambda x \lambda e. [\textit{stabbing}'(e) \wedge \text{Patient}(e, x)]$
 b. $\llbracket \Theta_{\text{Agent}} \rrbracket := \lambda x \lambda e. \text{Agent}(e, x)$

Hints: What you need to do is associate the string in (1a) with the meaning in (1b), using a tree which has ‘stabbed Caesar violently’ as a constituent and the revised meanings in (4). Don’t be daunted by the notion of a “silent element”: it’s just something which appears in our trees that isn’t pronounced (like a trace).

B Adjuncts (4 points)

Recall that an adjunct is something which, roughly speaking, leaves the thing it attaches to unchanged. In categorial grammar it seemed to make sense to say that adjuncts have categories of the form $X \backslash X$ or X / X , for example N / N for ‘big’ and ‘red’ (see homework 1) or $(S \backslash NP) \backslash (S \backslash NP)$ for ‘yesterday’ (see homework 2, part D). This way ‘big’ and ‘red’ will combine with something of category N and produce something of category N as the result, for example.

Transferring the CG idea

How would we encode the same idea for words like ‘big’ and ‘red’ in the formal transformational grammar that we have seen? i.e. What features should ‘big’ and ‘red’ have in this system? Assume that simple nouns like ‘cat’ and ‘dog’ are just:

- (5) $\text{cat} :: n$
 $\text{dog} :: n$

Problems with the CG idea

This “give me an X and I’ll produce an X ” idea seems pretty good, but the facts in (6), (7) and (8) cause a certain problem for it.

- | | | | | | | | | |
|-----|----|------------------|-----|----|----------------------|-----|----|--------------------------|
| (6) | a. | The [cats] run | (7) | a. | The [big cats] run | (8) | a. | The [big red cats] run |
| | b. | *The [cats] runs | | b. | *The [big cats] runs | | b. | *The [big red cats] runs |
| | c. | *The [cat] run | | c. | *The [big cat] run | | c. | *The [big red cat] run |
| | d. | The [cat] runs | | d. | The [big cat] runs | | d. | The [big red cat] runs |

Assume that ‘cats’ has just the same category as ‘cat’, i.e. $\text{cats} :: n$. Also, don’t worry about exactly how ‘the’ fits into the trees; you can basically ignore it, and just focus on the relationship between the bracketed noun phrase and the verb.

Explain why this pattern of agreement facts is a problem for the CG-based approach to adjuncts from above. Can you see a way around this problem, in the system of merge and move rules that we have adopted? Explain very briefly what a solution would look like, or why there is no feasible solution.

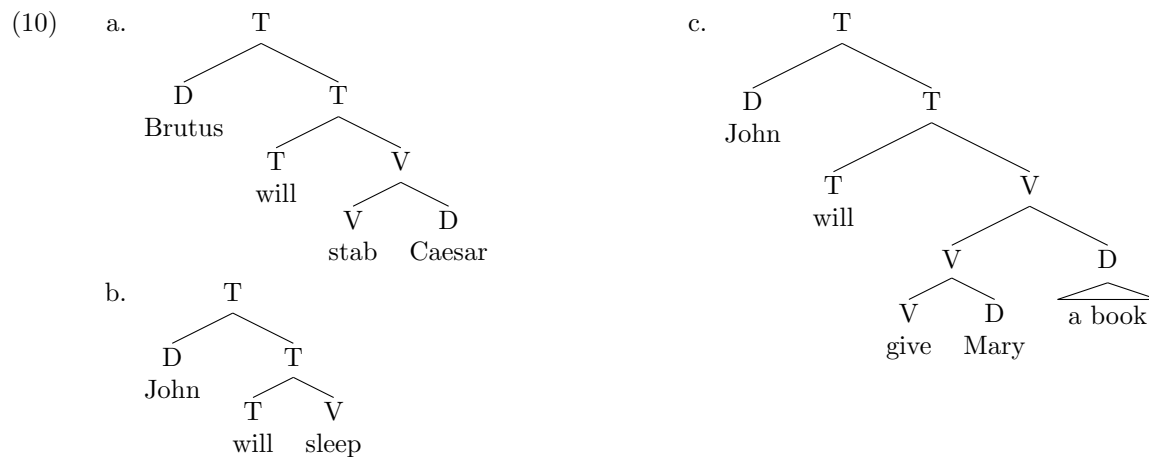
C Bare Phrase Structure (8 points)

Some notions originally from X-bar theory are defined *relationally* as follows in Bare Phrase Structure:

- (9)
- A **head** is a node that has no children.
 - A **maximal projection** is a node which does not have the same label as its parent.
 - An **intermediate projection** is a node which is neither a head nor a maximal projection.

Verb phrases

Consider the sentences in (10), with trees drawn in Bare Phrase Structure style.¹



Using the *relational* definitions in (9), can we state concisely which nodes the ‘do so’-substitution operation applies to based on the examples in (10)? If so, give the rule; if not, explain briefly what goes wrong. For each of the examples in (10), show at least one “test sentence” that you constructed to work out where ‘do so’-substitution can and can’t apply, and state what it tells us. (eg. ‘Brutus will stab Caesar, and John will do so too’ is grammatical; this tells us that in (10a), ‘do so’-substitution can apply to the constituent ‘stab Caesar’.)

Determiner phrases

Draw trees for the DPs in (11) using Bare Phrase Structure: nodes should only be labelled N, D, V, P or A, with no bar levels or XP labels; and there should be no “vacuous projections”/“non-branching nodes”. Don’t worry about the internal structure of the bracketed fragments, just draw a triangle over those.

- (11)
- the box [PP of books]
 - a glass [PP of water]
 - a cat

¹The structure given here for the sentence in (10c) is ... *ahem*, “simplified”. But it’s good enough for our purposes.

Using the *relational* definitions in (9), can we state concisely which nodes the ‘one’-substitution operation applies to based on the examples in (11)? If so, give the rule; if not, explain briefly what goes wrong. For each of the examples in (11), show at least one “test sentence” that you constructed to work out where ‘one’-substitution can and can’t apply, and state what it tells us.

More complex cases

Draw Bare Phrase Structure trees for the DPs in (12) and the sentences in (13). Remember: no bar-levels or XP labels, and no vacuous projections. And no triangles here.

- (12) a. the box of books in the corner
b. the man in the classroom
c. a large glass of water

- (13) a. Brutus will [stab Caesar [violently] [with a knife]]
b. John will [sleep [in his bed]] (NB: ‘his’ is a determiner)

Using the *relational* definitions in (9):

- Can we state concisely which nodes the ‘one’-substitution operation applies to based on all the examples we’ve seen now? If so, give the rule; if not, explain briefly what goes wrong.
- Can we state concisely which nodes the ‘do so’-substitution operation applies to based on all the examples we’ve seen now? If so, give the rule; if not, explain briefly what goes wrong.