Linguistics 819: Seminar on TAG and CCG

Alexander Williams, 11 March 2008

STAG and extraction

1 A general observation about 'semantic minimality'

- It is a guiding idea in TAG syntax to pre-compile all the various 'pre-cyclic' operations in the elementary objects.

  The internal structure of the elementary objects is not necessarily subject to the same structural principles that guide syntactic combination.

- The elementary objects are presumed to contain the verb and (slots for) all its arguments. This makes it seem like there is a semantic minimality corresponding to the minimal syntactic domain.

  And if that were right, we'd expect that the semantic structure internal to an elementary tree is determined by principles less general than those that go with the syntax—say, conjunction and application.

  In one important sense, that's correct, if you think about thematic relations as essentially arbitrary.

- HOWEVER, in order localize operations like wh-movement, the elementary trees are generally presumed to contain the entire "extended projection" of the predicate. So the V tree will also contain T and maybe C.

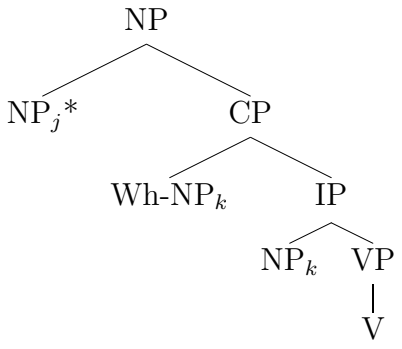
- Is the semantic interaction of COMP and INFL, with each other, with V, and with the NPs, just as arbitrary as the semantic as the semantic relation between the NPs and the verb? (Hard to see what that would even mean.)

- The payoff of localizing movement in TAG was supposed to be a nice account of long-distance movement (Raising or wh-movement). But Is the corresponding semantics any nicer?

2 Pied piping and relative clauses

- Standard TAG elementary tree for a relative clause:

(1)



- Under the usual understanding of elementary trees, you can't get any lower than just the Sub site for the NP *containing* the relative pronoun.

- However, we want to unify the variable for the Adjunction site with the variable for the relative pronoun, which may be arbitrarily embedded.

  (2) The problem **whose solution's original proof's flaw** was more famous that it was.

  The whole Wh-NP has to bind the gap in the RC, but the abstraction associated with the Wh has to take scope over the whole relative clause.

2.1 Flat semantics with underspecification (Han 2002)

- Working within the framework of Joshi & Kallmeyer, Han (2002) gives a relatively simple account of cases which one level of embedding. But the account dissolves in the general case.

- There are two ways of dealing with the general case.

  1. First, build the genitive into the RC tree for the predicate. But this violates general ideas of minimality in elementary trees. Worse, it would seem to require infinitely many elementary trees.

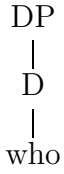
  2. Build abstraction over a distinguished variable—one typed as a *wh* variable—into the semantics for the RC tree.
     This variable, no matter how deeply embedded, will be accessible to the semantics of the RC, inasmuch as the semantics is flat.

2.2 From the STAG perspective

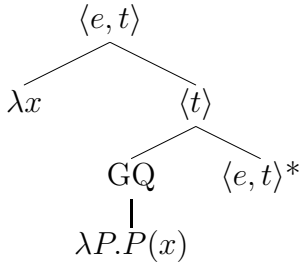
2.3 Han

(3) WHO (relative pronoun)

a.



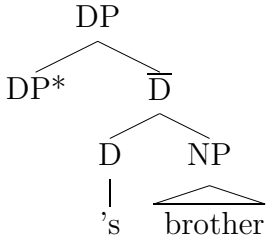
b.



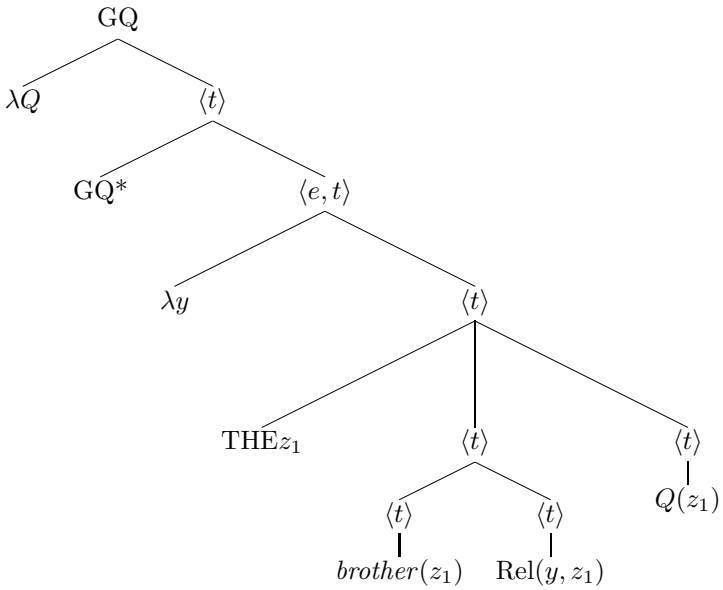
Comments
The semantics for the relative pronoun expresses abstraction over a variable.

(4) 'S BROTHER

a.



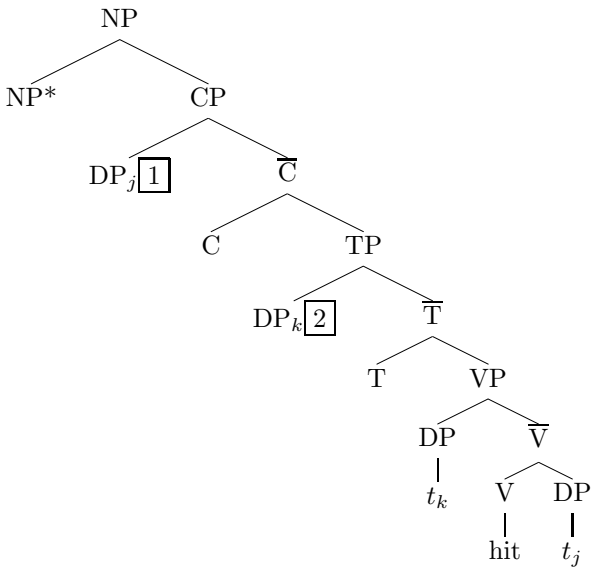
b.



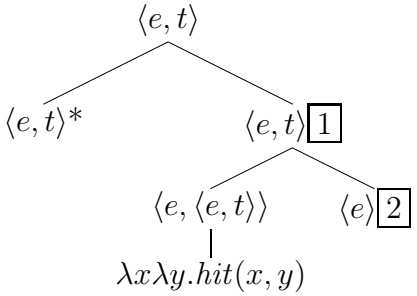
Comments

(5) HIT [relative clause tree]

a.



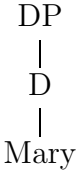
b.



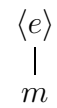
Comments
Notice that the 1 substitution node in the syntactic tree—where the relative pronoun goes—is linked with an internal node of predicative type in the semantics!

(6) MARY

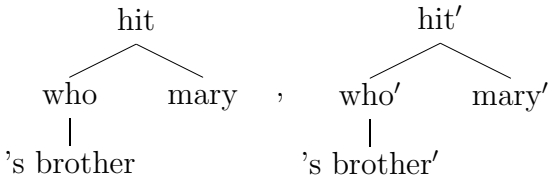
a.



b.

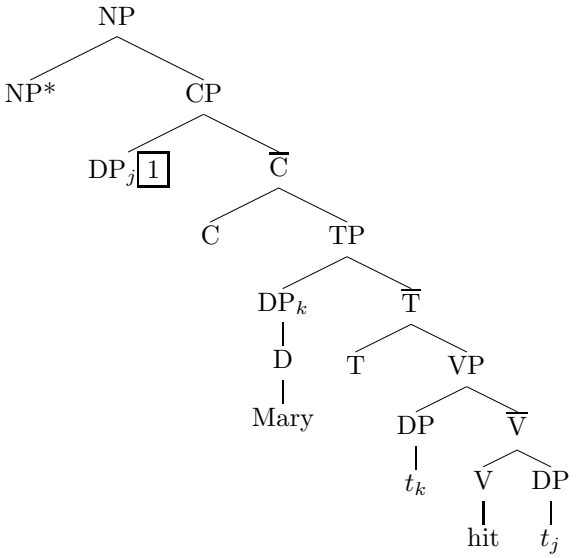


(7) Derivation of WHOSE BROTHER MARY HIT, described in top-down order



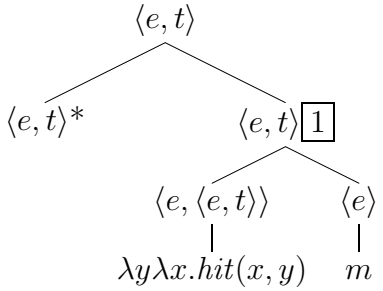
a. MARY and HIT

i. Syntactic tree for MARY (6a) substitutes into HIT (7c-i) at 2



Comments

ii. Semantic tree for MARY (6b) substitutes into HIT (7c-ii) at 2

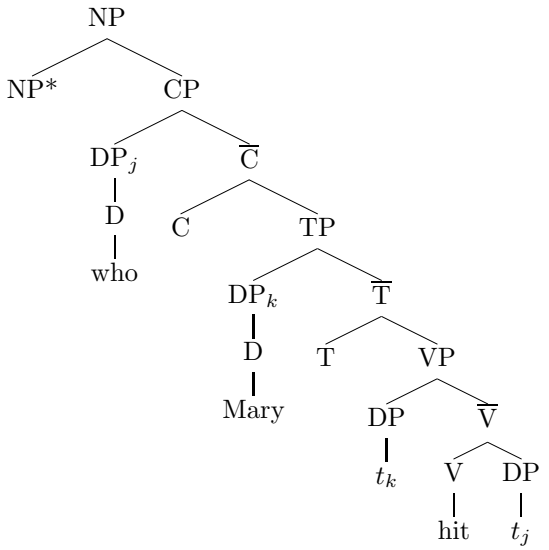


Comments

Simple substitution; will be interpreted by converting λy for m.

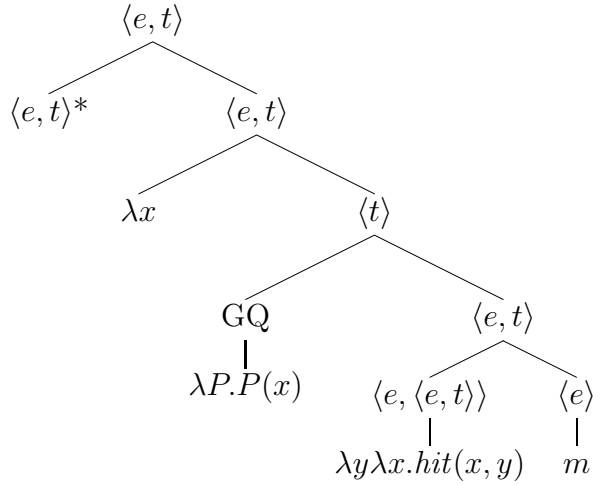
b. WHO and HIT

i. Syntactic tree for WHO (3a) substitutes into HIT (7c-i) at $\boxed{1}$



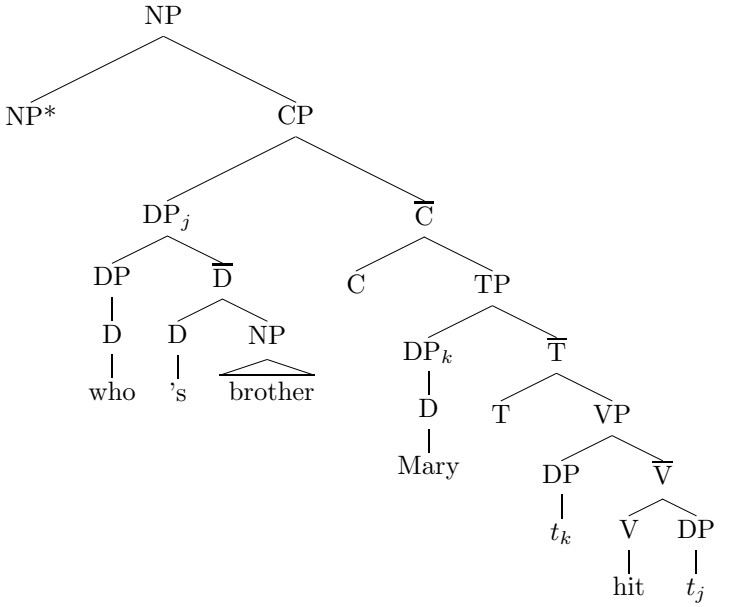
Comments
Simple substitution

ii. Semantic tree for WHO (3b) **adjoins** into HIT (7c-ii) at $\boxed{1}$

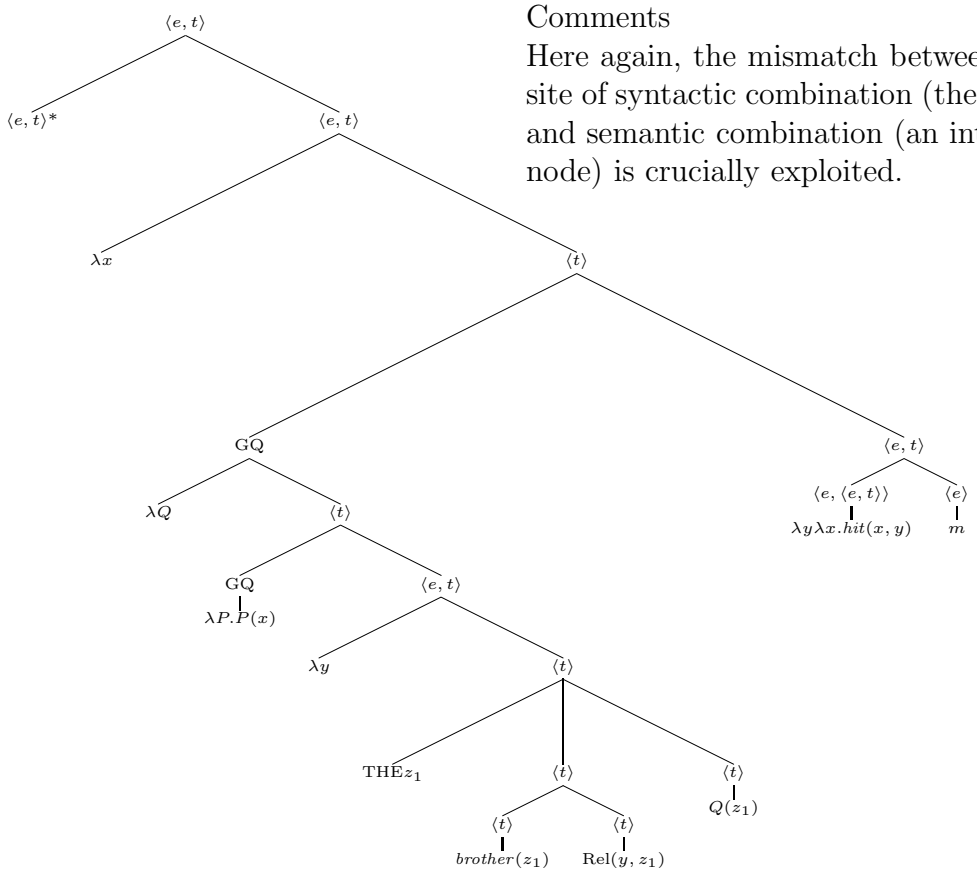


c. 'S-BROTHER and WHO

i. Syntactic tree for 'S-BRO (4a) adjoins onto WHO (3a) **at its root**



ii. Semantic tree for 'S-BROTHER (4b) adjoins **into** WHO (3b) at its **internal** GQ node



Comments
Here again, the mismatch between the site of syntactic combination (the root) and semantic combination (an internal node) is crucially exploited.

To interpret this, conjoin expressions of like type, and performing λ-reduction where required:

$$\lambda x.\iota z_1.[brother(z_1) \wedge \text{Rel}(x, z_1)][hit(m, z_1)]$$

- Clearly enough, there is no problem with "recursion" of the genitive.

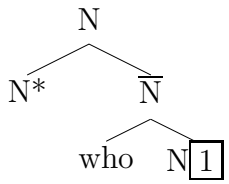
- No pied-piping: ...

2.4 Nesson and Schieber

(8) The lexical components for "whose solution is difficult"

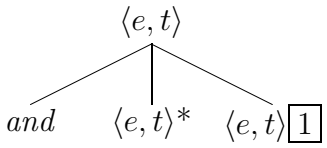
a. WHO

i.



Comments

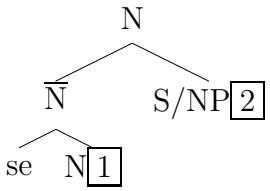
ii.



Comments
The relative pronoun introduces the relation of predicate conjunction between the RC (here N!) and the noun it modifies.

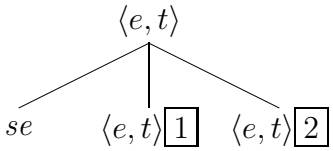
b. Possessive 'S

i.



Comments
The possessive has two syntactic arguments: an N, and a clause with a gap in it.

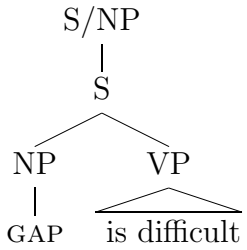
ii.



SE introduces a relation between two predicate meanings

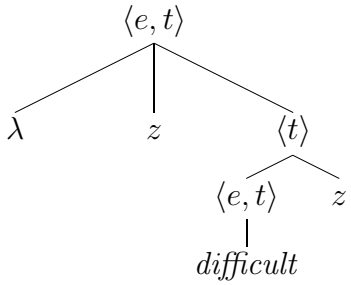
c. DIFFICULT

i.



Comments
This is a lexical entry for DIFFICULT with abstraction over its argument

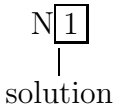
ii.



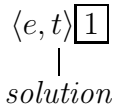
Comments
This just says that the "lifted" tree for DIFFICULT means 'difficult'

d. SOLUTION (or any other noun)

i.



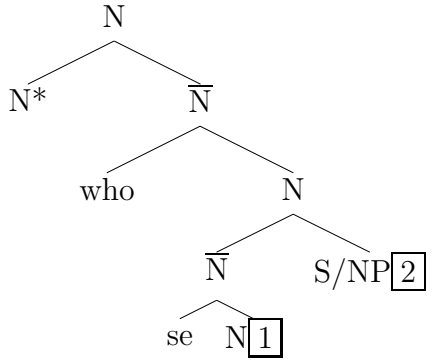
ii.



(9) The derivation of "whose solution is difficult"

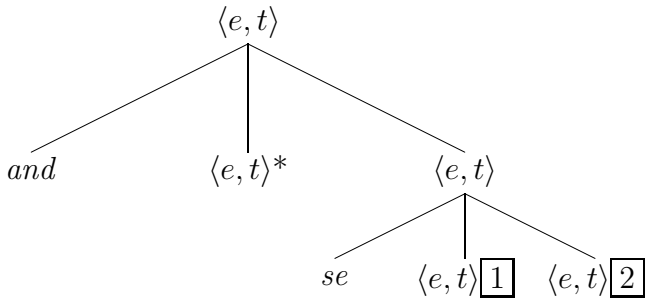
a. SE combines with WHO

i. Syntactic tree for SE substitutes into WHO at 1



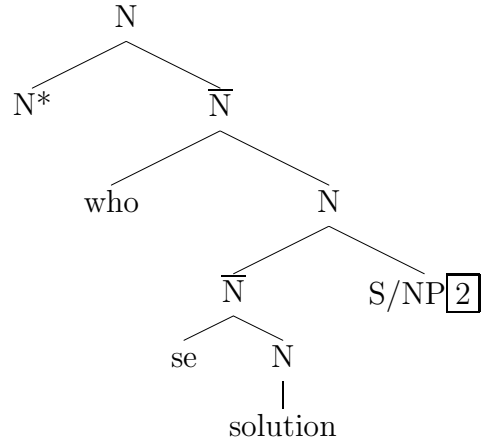
Comments

ii. Semantic tree for SE substitutes into semantic tree for WHO at $\boxed{1}$

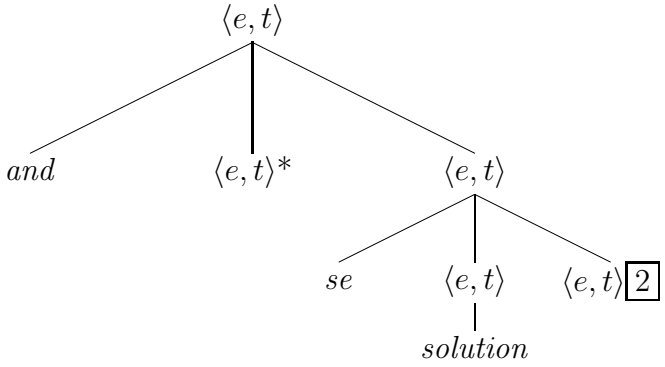


b. SOLUTION combines with SE

i. Syntactic tree for SOLUTION substitutes into SE at $\boxed{1}$

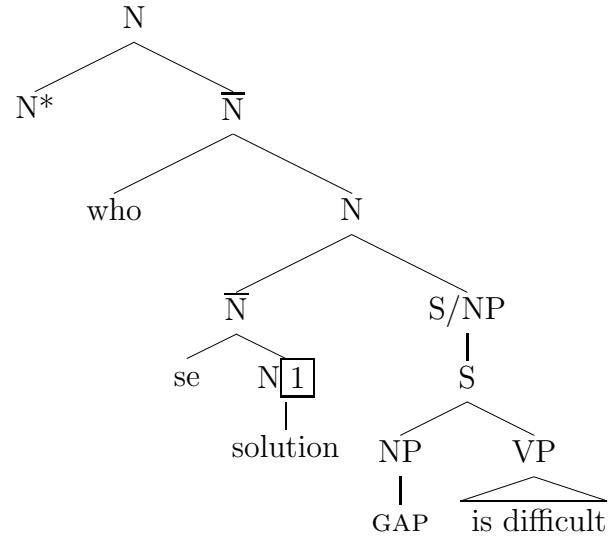


ii. Semantic tree for SOLUTION substitutes into SE at $\boxed{1}$

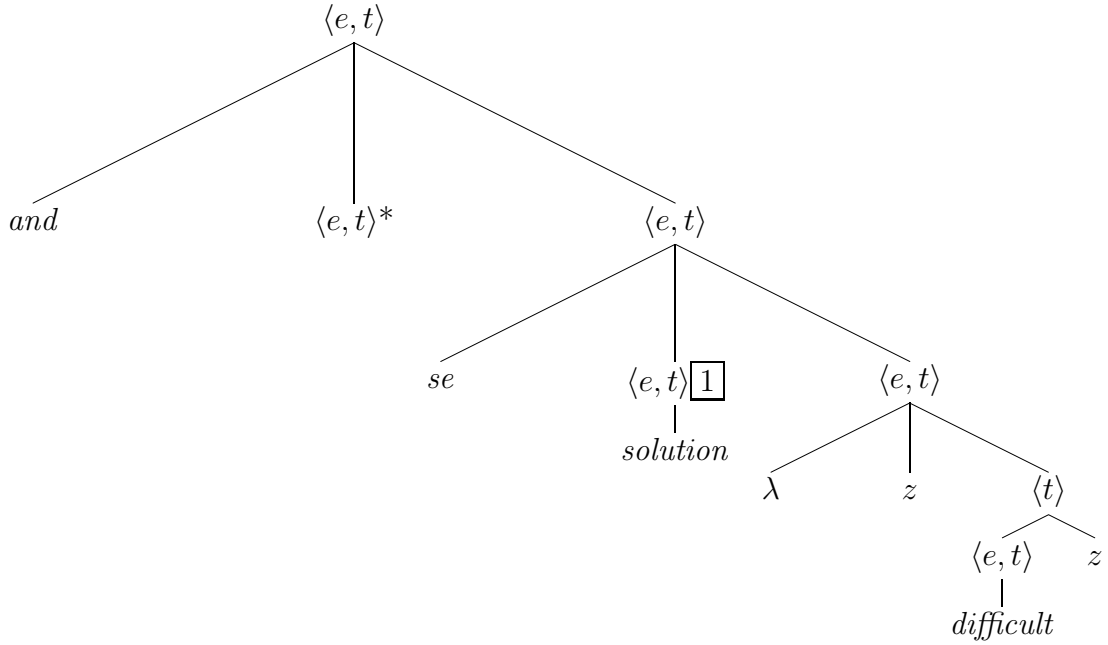


c. DIFFICULT combines with SE

i. Syntactic tree for DIFFICULT substitutes into SE at $\boxed{2}$



ii. Semantic tree for DIFFICULT substitutes into SE at $\boxed{2}$



d. Interpreting this "LF"

i. *se* is defined as:

$$\lambda P \lambda Q \lambda x.\text{THE}y[\text{AND}(\lambda z.\text{POSS}(x, z), P)(y), Q(y)]$$

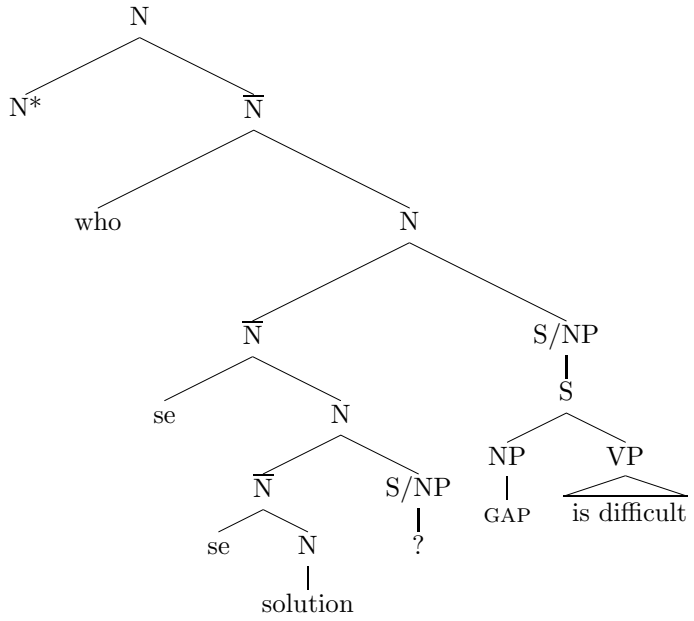
Give it two predicates P and Q (e.g. being a solution and being difficult) and it returns the property of being an x such that there is a unique y that x possesses with property P, and y has property Q.

ii. So the LF reduces to:

$$\lambda P.\text{AND}(P, [\lambda x.\text{THE}y(\textit{solution}(y) \wedge \text{POSS}(x, y), \textit{difficult}(y))])$$

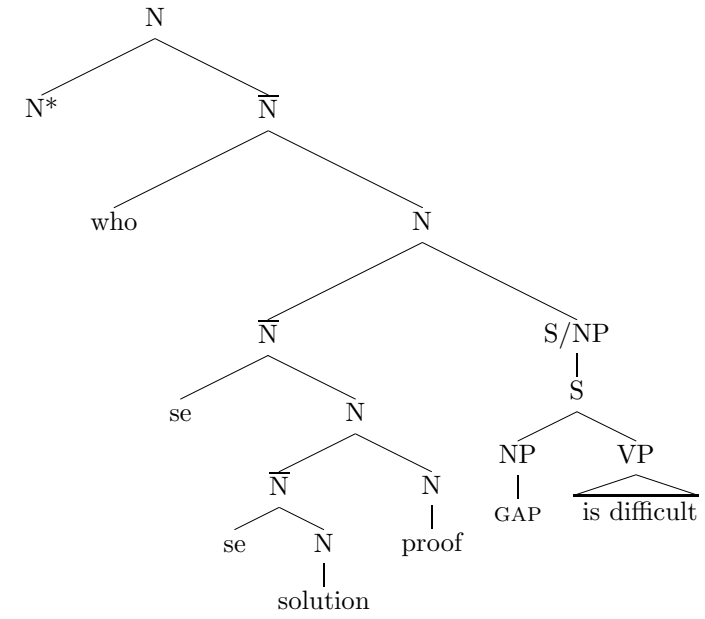
- This plainly does directly generalize to cases of multiple genitive embeddings, like "whose solution's proof."

(10)



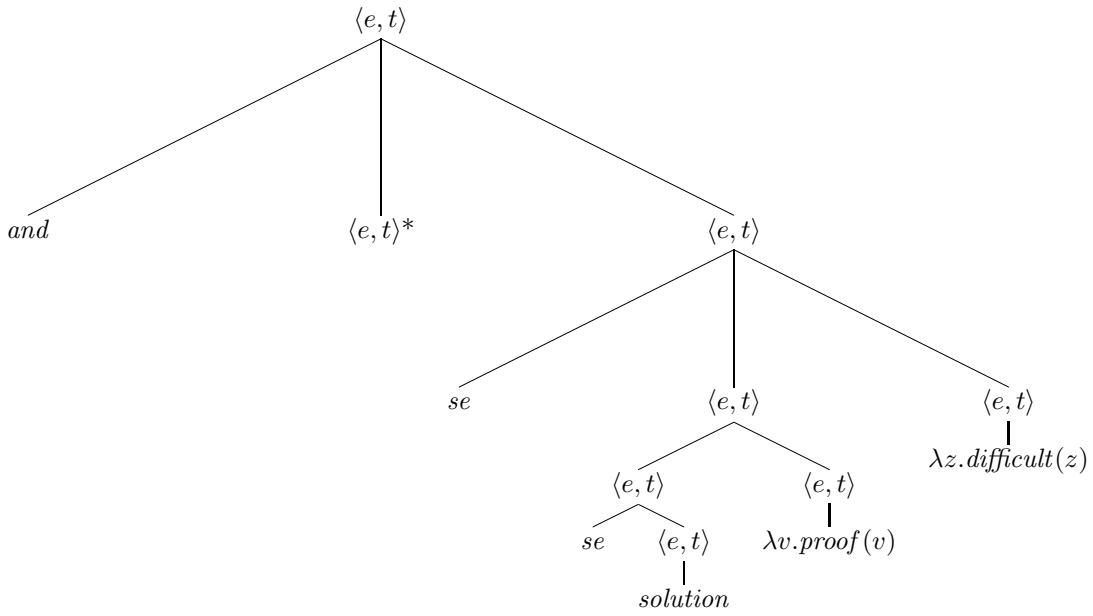
- If we allow SE to syntactically relate, not just an N and a gapped clause, but also an N and an N, we could derive:

(11)



- But the meaning would be wrong, because the *semantic* relation between the two syntactic argument's of SE is (perversely) not possession.

(12)



The property of "se solution proof" is:

$$\lambda v.\text{THE}u[\text{POSS}(v,u) \wedge \text{solution}(u), \mathit{proof}(u)]$$

That is the property of having a unique solution that is also a proof. There is no possession relation between the solution and the proof—just like, in the unembedded genitive, there's no possession relation between the solution and the property of being difficult.

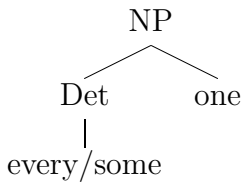
3 Other analyses in N&S

3.1 Multiple NP quantifiers

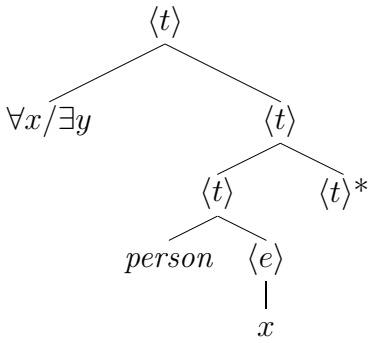
(13) Every person likes some person

a. EVERY/SOME-ONE

i.



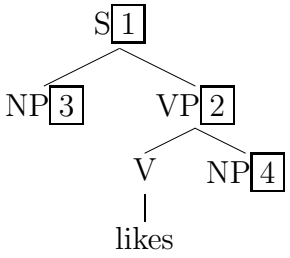
ii.



Comments
This is a MC set of trees. The 'top' semantic tree an auxiliary tree which will adjoin to a $\langle t \rangle$ node. The bottom is a bound variable.

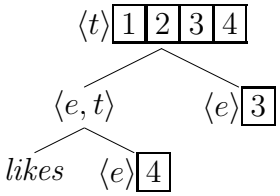
b. LIKES

i.



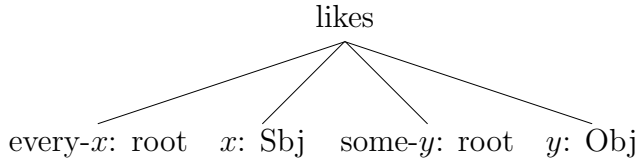
Comments

ii.



Comments
The "QR'd" portions of the subject and object semantics attach to the root. The variables they bind go in the argument positions. Anything that attaches syntactically to VP attaches semantically at the root.

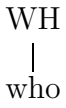
c. Single scope-neutral derivation tree, with the QR'd parts of both quantifiers adjoining to the root



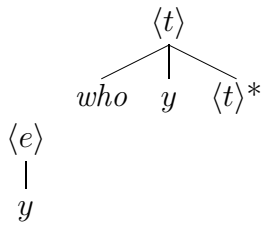
3.2 Long-distance WH movement

(14) a. WHO

i.



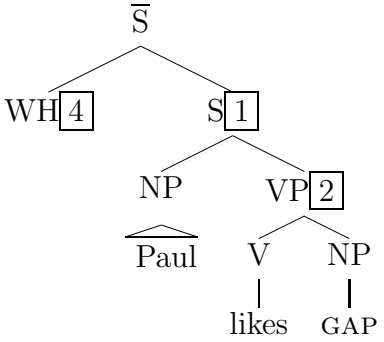
ii.



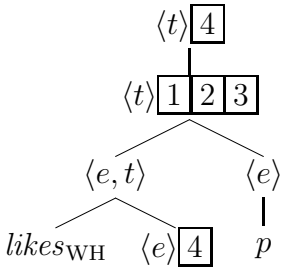
Comments
The WH introduces a quantifier and a variable.

b. Object-extraction tree for PAUL LIKES

i.



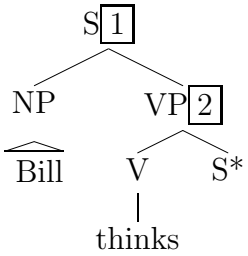
ii.



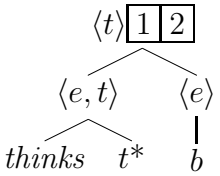
Comments The semantic trees for the WH get put in two spots: the top gets maximal scope, above anything that substitutes into the subject or adjoints to the VP.

c. BILL THINKS

i.

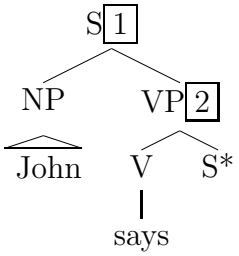


ii.

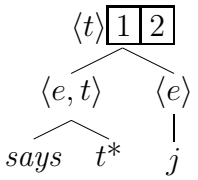


d. JOHN SAYS

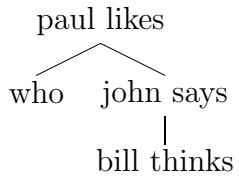
i.



ii.



e. Derivation tree for "Who does Bill think John says Paul likes," abstracting from *do*-support

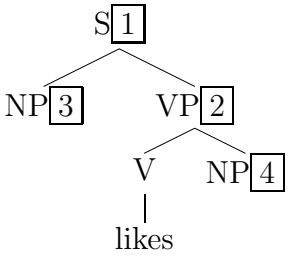


Notice that the WH operator will take maximal scope.

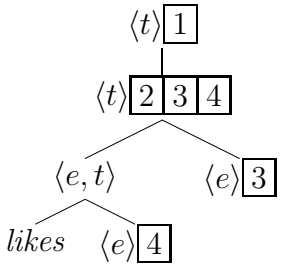
3.3 Keeping quantifiers in the clause

- This representation allows scope interaction between all quantifiers and VP adjuncts, but keeps all of these within the scope of their containing clause:

(15) a.



b.



- AW comment: Scope interactions with the subject of a control verb will of course cause a problem:

  (16) At least two people want to kiss everyone.

4 Lifting NPs and trimming the trees

- In their more recent paper, Nesson and Schieber propose to treat *all* NPs as Joshi proposed to treat quantificational NPs. All NPs contribute two component trees:

  1. One adjoining to S and contributing an operator
  2. One substituting into argument NP positions and contributing a variable.

- Moreover, they suggest the lexical content of the NP can be associated with either part. This allows them a univocal treatment of:

  - Moved WH and in-situ WH
  - Topicalized NP and in-situ NP

- By also assigning a contentless 'floating scope node' to PPs, they get a neater analysis of preposition stranding.

  (17) Who did you see a picture of?

The S-part of the *who* tree-set adjoins to the S-part of the PP, while the NP-part substitutes into the argument of the preposition. The two complex trees then combine with *see*.

This makes the derivation tree-local, a desideratum that is hard (or impossible) to achieve if P's don't come with a degenerate S node (cp. Kallmeyer & Scheffler).

- A concomitant of the N&S analysis is that WH-movement and Topicalization are no longer 'pre-compiled' in the elementary tree of the verb. They are instead derived in syntax.

- One attraction of this (that they don't mention) is that, by reducing the semantic domain of the elementary tree for verbs, we shrink the domain for noncompositional operations.

- Syntactically, however, stipulations that were stated by brute force over lexical items in classical TAG will have to restated in the form of features that control derivations (or their outputs). For example, we will need to block:

  (18) Multiple wh-movement
  - a. * Who what did Bill give?
  - b. Who did Bill give what?

  (19) Multiple topicalization
  - a. * Frank, a flower, Bill gave *last year*.
  - b. Frank, Bill gave a flower *last year*.

- As a minor detail, note that it will be necessary to have topicalized NPs adjoin to the topmost $\langle t \rangle$ node—while keeping nontopicalized NPs at the lower $\langle t \rangle$ node—in order to ensure widest possible scope for the former.

  (20) At least two movies, every boy in *my* generation has *definitely* seen.