

Lec19: Other syntactic representations-2

HUL 242

11/4

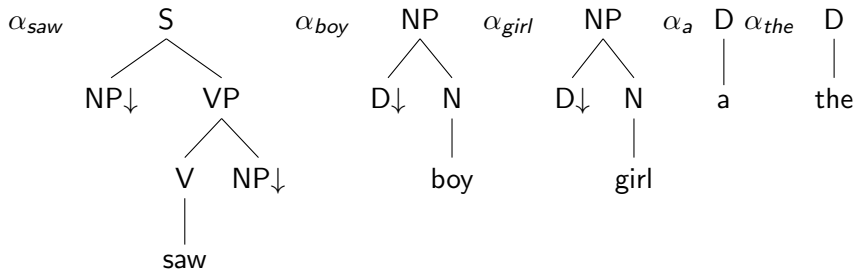
Tree rewrite systems more powerful than CFGs
Capture more linguistically interesting information than CFGs

Tree Adjoining Grammar

TAG definition

A formalism in which the elementary structures of a grammar are phrase structure trees;
and the combining operations are adjunction and substitution

Tree fragment rewrites



Derived tree

the boy saw a girl

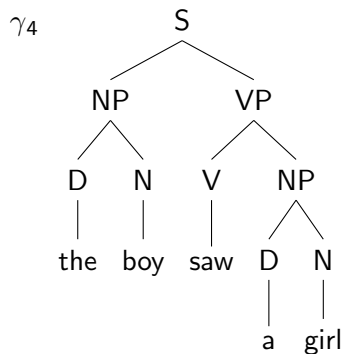


Figure : Derived tree γ_4 for '*the boy saw a girl*'

Derivation tree

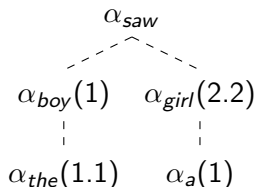


Figure : Derivation tree showing all the substitutions that lead to γ_4 . Dashed edges represent substitution operation.

- The numbers represent Gorn addresses

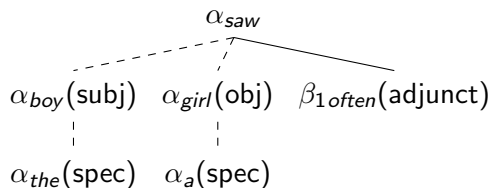
Derived tree and derivation tree

Derivation tree records history of derivations

Derivation tree can be linguistically interpreted as a dependency relation tree

Relations of subject and object can be read off the derivation tree

Derivation tree similar to dependency structure



Domain of locality

- Elementary trees (tree fragments) are used to specify linguistic constraints (e.g. subcategorization)
- Specify 'all' linguistic constraints over the domain of the elementary trees
- As this is not possible with CFG, (constraints spread out over more than one rule)
- Elementary trees have an *extended domain of locality* as compared to CFGs

Elementary trees

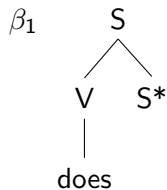
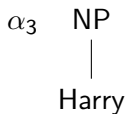
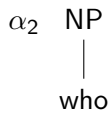
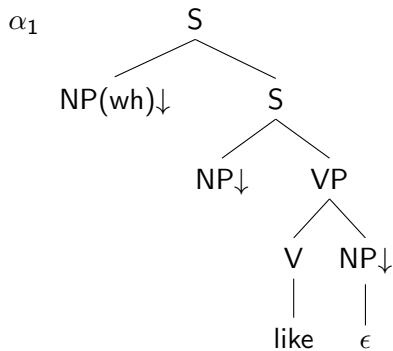
- Elementary trees are the primary units of analysis
- Lexicalized, i.e. associated with a lexical anchor
- Complex structures i.e. more than one elementary tree associated with a word/lexical item

Elementary trees

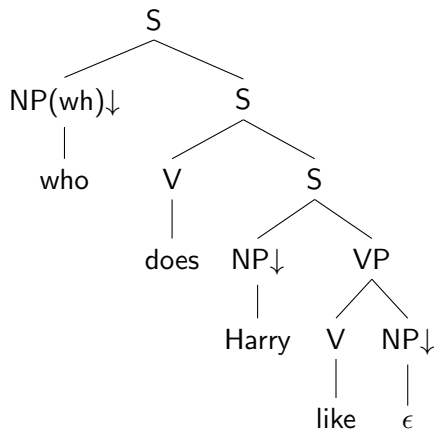
Specification of elementary trees are separate from the operations used to combine them

More complicated primitive structures; Simple, general rules to combine them

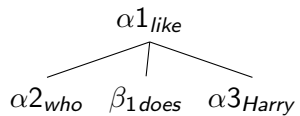
Who does Harry like?



Post substitution and adjunction



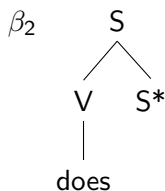
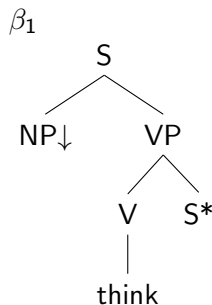
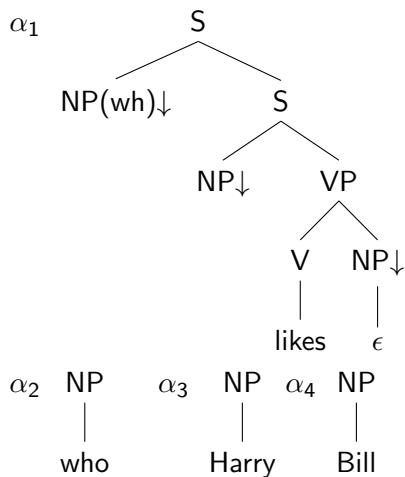
Derivation tree



Elementary tree types

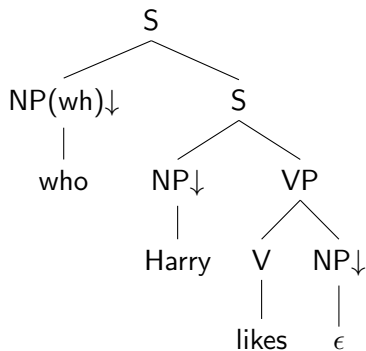
- Trees that have minimal linguistic structure are **initial** trees (α trees)
; Nodes marked for substitution
- Auxiliary trees usually represent recursive portions of the grammar (*beta* trees) ; Foot node that is identical to root node

Who does Bill think Harry likes?

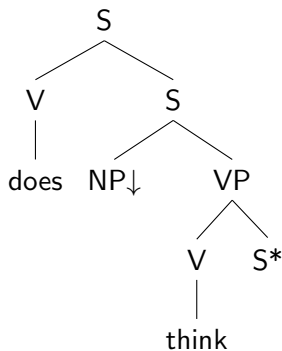


Who does Bill think Harry likes?

α_1



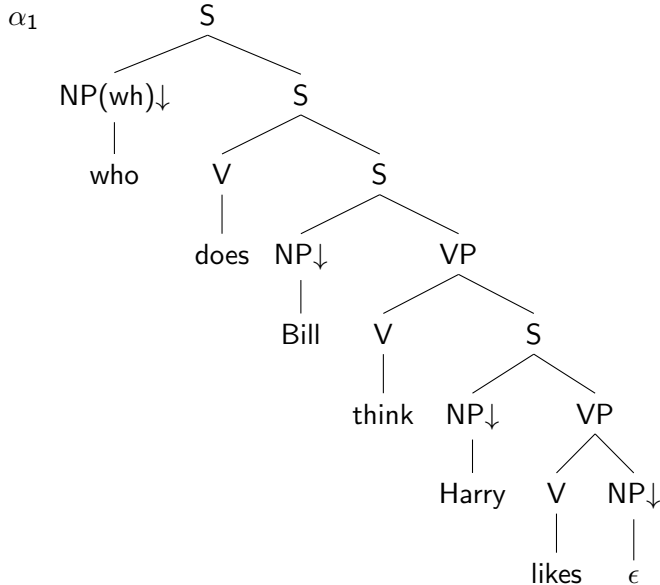
β_1



α_4



Who does Bill think Harry likes?

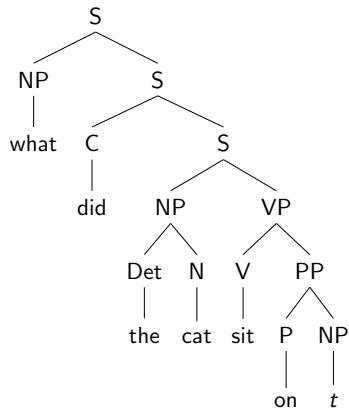


Who does Bill think Harry likes?

- Dependency between *who* and the complement NP is stretched
- This is a result of the operations of adjunction + specification of elementary structures
- All long distance dependencies are converted to local dependencies in TAG

Find elementary trees

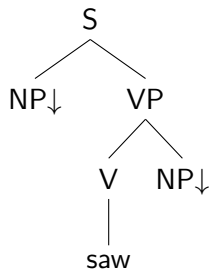
What did the cat sit on?



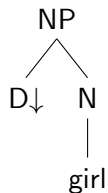
Relative clauses

The girl who met Bill saw a bird

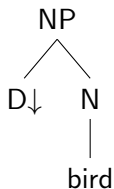
α_1



α_2



α_3

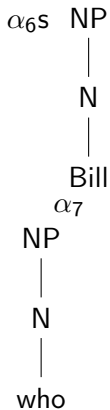
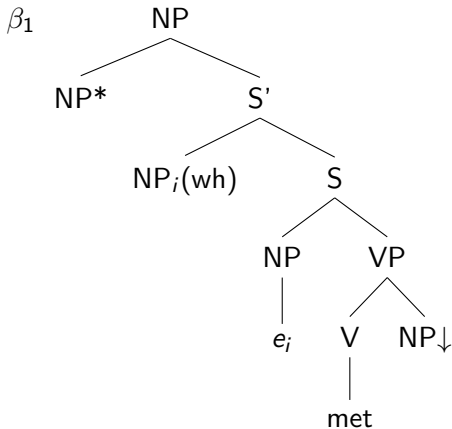


α_4

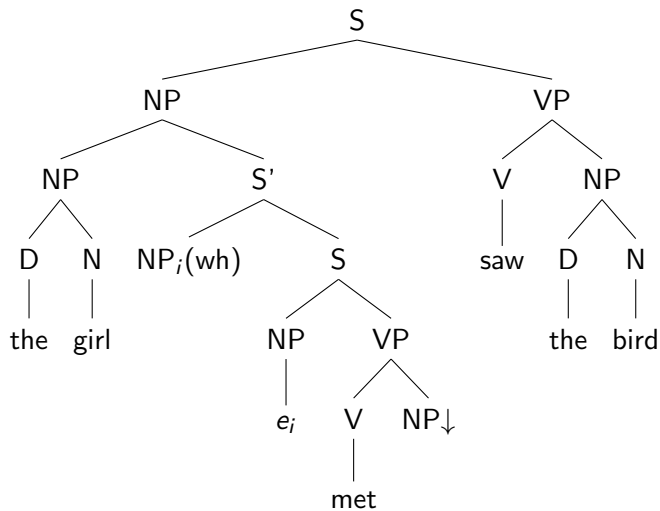


α_5

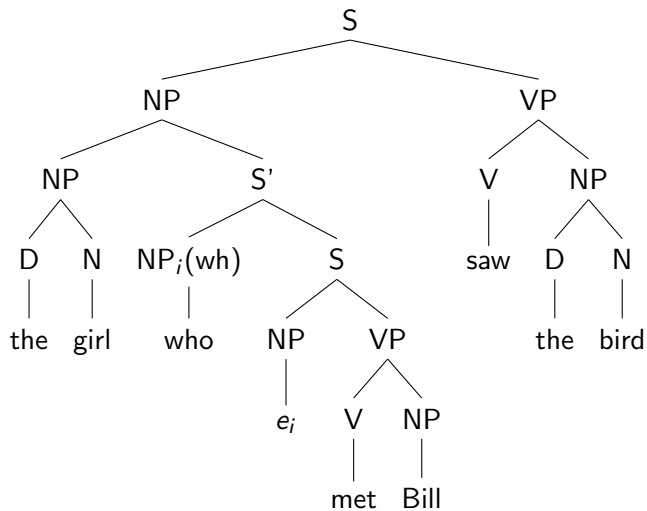




Adjunction of Rel Clause



Final derivation tree



Same lexical item=Many elementary trees

- The lexical item *likes* can be an anchor for a number of constructions
 - ▶ simple NP-VP construction
 - ▶ relative clause,
 - ▶ passive
- Creates some redundancies, hence grouped together into tree families

Supertags

- Elementary trees associated with a lexical item can be treated as informative parts of speech
- The lexical item + elementary tree structure gives richer lexical descriptions aka 'supertag'
- This can be thought of as having psycholinguistic relevance as well

PP attachment

- Structural ambiguity can be re-looked at as a case of lexical (supertag) ambiguity

The man saw a boy with a telescope

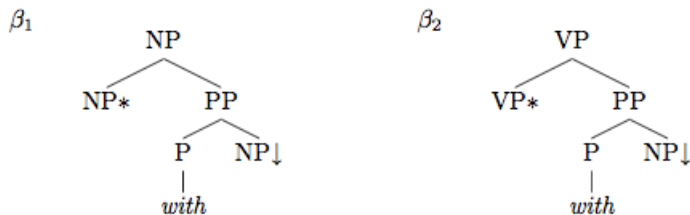


FIGURE 1.15 Two supertags for *with*

- Lexical items + structural information is used for creating initial parsing commitments
- Once elementary trees are chosen, only limited number of operations possible