Tree Adjoining Grammars

The XTAG Project

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The XTAG-project

... was located at the University of Pennsylvania (ca. 1988-2001)

... created the following components:

- **Grammar** (set of tree templates/families)
- **Tools** (browser, editor, parser, ...)

- URL: `http://www.cis.upenn.edu/xtag/`
- Manual: XTAG Research Group [2]

The architecture of the XTAG-grammar

Morph database	$\rightarrow$	inflected form $\rightarrow$ root form, POS, inflectional information
Syntactic database	$\rightarrow$	root form, POS $\rightarrow$ list of tree templates or tree families, list of feature equations
Tree database	$\rightarrow$	list of tree templates and tree families

Example: **Tree template** for the declarative transitive verb (αnx0Vnx1), where $\diamond$ marks the lexical insertion site:

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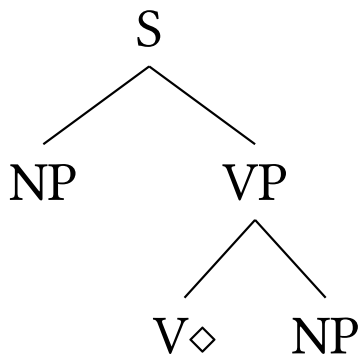

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A tree family

- is a set of tree templates,
- represents a subcategorization frame, and
- unifies all syntactic configurations the subcategorization frame can be realized in.

Example: αnx0Vnx1 $\in$ Tnx0Vnx1

The architecture of the XTAG-grammar - Counts

subcategorization frame	# tree fam.	# tree temp.
intransitive	1	12
transitive	1	39
adjectival complement	1	11
ditransitive	1	46
prepositional complement	4	182
verb particle constructions	3	100
light verb constructions	2	53
sentential complement (full verb)	3	75
sentential subject (full verb)	4	14
idioms (full verb)	8	156
small clauses/predicative	20	187
equational 'be'	1	2
ergative	1	12
resultatives	4	101
it clefts	3	18
total	57	1008

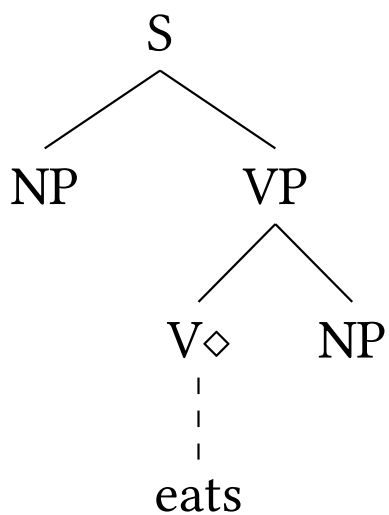
(from Prolo [1])

Lexical insertion

Lexical insertion

Drawing an edge between the lexical anchor and the lexical insertion site

- prior to substitution and adjunction
- The feature structures of the **lexical anchor** and the **insertion site** unify.



Morph database

```
precipitate             precipitate     N 3sg#precipitate       A#precipitate   V INF
beeping                 beep    V PROG
choosing                choose  V PROG
cubbing                 cub     V PROG
ate                     eat     V PAST STR
engrafts                engraft V 3sg PRES
pends                   pend    V 3sg PRES
refrains                refrain N 3pl#refrain   V 3sg PRES
trailing                trail   V PROG
birch-rod               birch-rod       N 3sg
blue-jackets            blue-jacket     N 3pl
sea-gods'               sea-god N 3pl GEN
star-crossed            star-crossed    A
stillhunts              still-hunt      V 3sg PRES
Indonesia               Indonesia       PropN 3sg
```

- around 317 000 inflected items

Syntax database

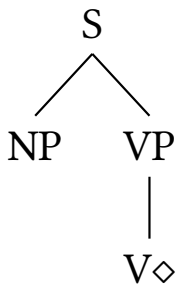
```
<<INDEX>>eat<<ENTRY>>eat<<POS>>V<<ENTRY>>away<<POS>>PL<<FAMILY>>Tnx0Vplnx1
<<INDEX>>eat<<ENTRY>>eat<<POS>>V<<ENTRY>>up<<POS>>PL<<FAMILY>>Tnx0Vplnx1
<<INDEX>>eat<<ENTRY>>eat<<POS>>V<<FAMILY>>Tnx0V
<<INDEX>>eat<<ENTRY>>eat<<POS>>V<<FAMILY>>Tnx0Vnx1
<<INDEX>>eatable<<ENTRY>>eatable<<POS>>A<<FAMILY>>Tnx0Ax1 Ts0Ax1<<FEATURES>>#A_WH- #A_compar-
<<INDEX>>eatable<<ENTRY>>eatable<<POS>>A<<TREES>>^CAn ^BA ^BAXA<<FEATURES>>#A_WH- #A_compar-
```

- over 30 000 entries

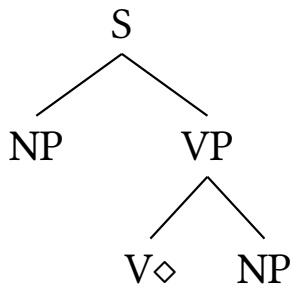
Example: complementation with NPs and PPs (base cases)

Complementation with NPs:

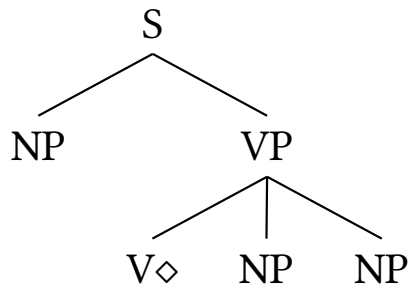
αnx0V:



αnx0Vnx1:



αnx0Vnx2nx1:



Complementation with PPs: substitution or co-anchor

αnx0Vnx1pnx2:

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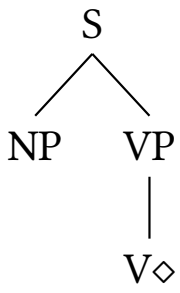
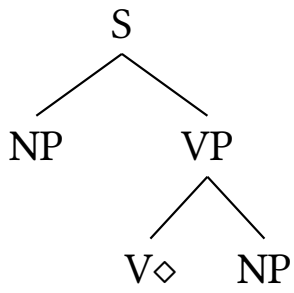
Example: complementation with NPs and PPs (base cases)

Complementation with NPs:

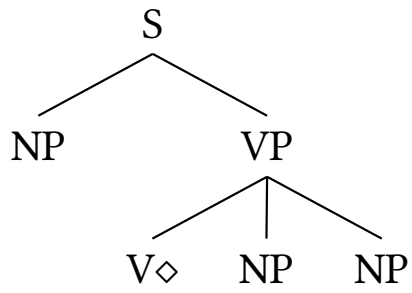
αnx0V:



αnx0Vnx1:



αnx0Vnx2nx1:



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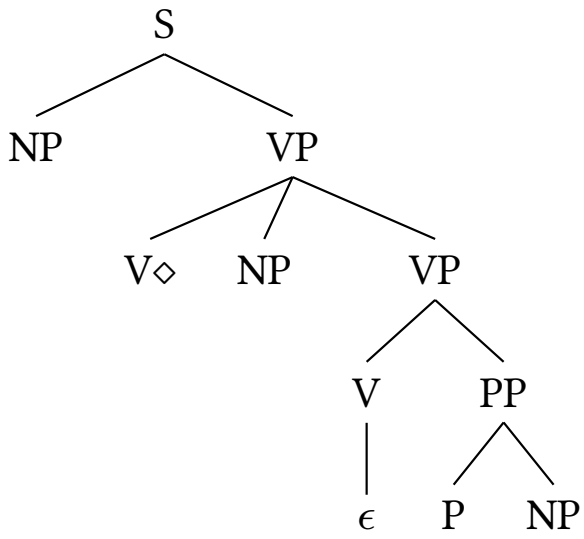
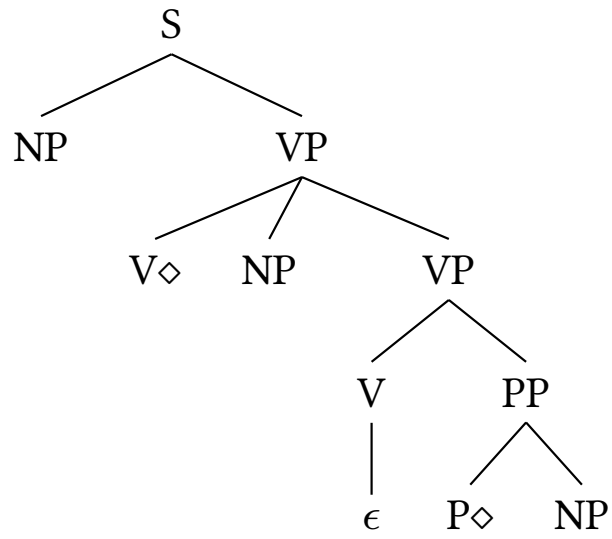
αnx0Vnx1Pnx2: