

Tree Adjoining Grammars

Syntax: Extraction in LTAG

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Outline

- 1 Extraction – Basics
- 2 Unbounded dependency
- 3 Islands for extraction
- 4 Subject-auxiliary inversion
- 5 Relative clauses

Extraction - Basics

The movement metaphor:

- Relating syntactic configurations in a derivational hierarchy.
- **Traces** and **coindexation** are used to express derivational subordination.

Topicalization/Extraction:

Placing a post-verbal constituent into a sentence-initial position.

- (1) a. Sandy loves Kim. (base configuration)
b. Kim_i, Sandy loves _i . (NP-topicalization)
c. On Kim_i, Sandy depends _i . (PP-topicalization)

Wh-extraction - Basics

Wh-Extraction:

Placing a constituent as **wh-phrase** into a clause-initial position.

- (2) a. I wonder [who_i Sandy loves _i] . (indirect question)
b. Who_i does Sandy love _i . (direct question)
c. Sandy loves Kim_i [who_i Irmgard hates _i] . (relative clause)

Wh-extraction - More basics

Pied piping:

Additional material along with wh-pronouns is fronted.
(The fronted wh-phrase may be larger than the wh-pronoun.)

(3) This is the book [[for which]_i Peter has been waiting _i].

(4) This is the book [[the covers of which]_i I have designed _i].

Preposition stranding:

Material from the wh-phrase is left in base position.

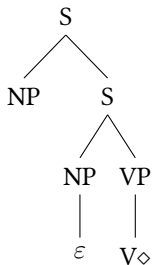
(5) This is the book [which_i Peter has been waiting for _i].

(6) This is the book [which_i I have designed the covers of _i].

Extraction - Tree templates

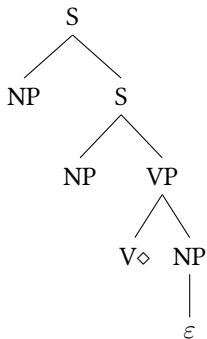
subject extraction

$(\alpha W0nx0V)$



object extraction

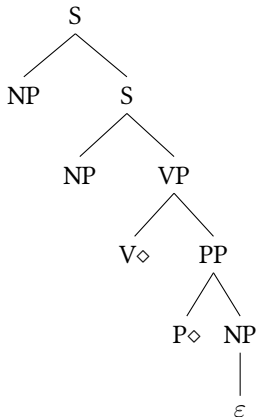
$(\alpha W1nx0Vnx1)$



Extraction - Tree templates

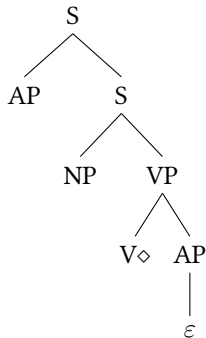
preposition stranding

$(\alpha W1nx0VPnx1)$



adjective complement extraction

$(\alpha WA1nx0Vax1)$



Unbounded dependency

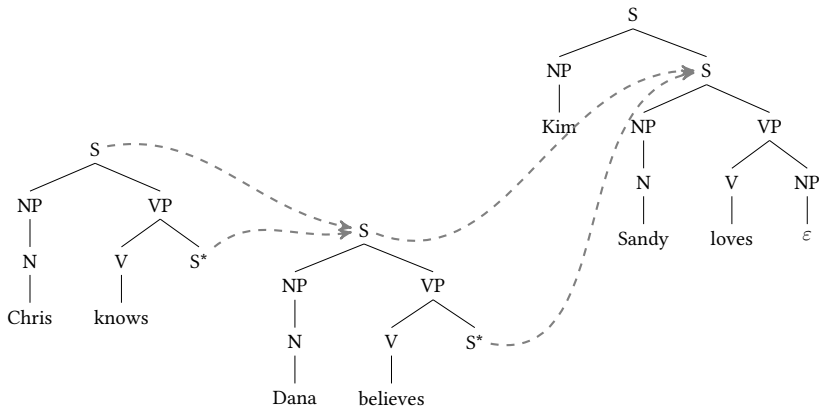
Unbounded dependency:

The dependency between an extracted constituent and its trace may extend **across arbitrarily many clause boundaries**.

- (7) a. Kim_i, Sandy loves ___i .
b. Kim_i, Chris knows [Sandy loves ___i].
c. Kim_i, Dana believes [Chris knows [Sandy loves ___i]].
- (8) a. I wonder [who_i Sandy loves ___i].
b. I wonder [who_i Chris knows [Sandy loves ___i]].
c. I wonder [who_i Dana believes Chris knows [Sandy loves ___i]].

Unbounded dependency - XTAG-analysis (outline)

(9) Kim_i, Chris knows [Dana believes [Sandy loves _i]].



⇒ extended domain of locality and factoring of recursion (recursive adjunction)

Islands for extraction

■ Adjuncts:

(10) *[Which movie]_i did Gorgette fall asleep [after watching _i].

⇒ No such elementary tree for the adjunct!

■ Coordination

(11) *Who_i did Sandy love [_i and Kim].

⇒ No such elementary trees for the coordinated NP and for the governing verb!

Islands for extraction

- **Finite sentences with complementizer** (subject extraction)
(In GB: Empty Category Principle/Subjacency):

(12) *Who_i did Alice say [that ___i left].
Who_i did Alice say [___i left].

⇒ No such elementary trees!

- **Finite sentences with complementizer** (object extraction)

(13) *Who_i did the elephant whisper [that the emu saw ___i] ?
Who_i did the elephant say [that the emu saw ___i] ?

⇒ Filtering by features:

comp = nil, where non-bridge verbs attach (*whisper*)

comp = nil/that, where bridge verbs attach (*say*)

Subject-auxiliary inversion

Subject-auxiliary inversion

The auxiliary verb ('do', 'have', 'be', 'can', ...) precedes the subject.

- **No subject-auxiliary inversion** in embedded wh-questions:

- (14) a. I wonder [what_i John reads ___i].
b. *I wonder [what_i **does** John read ___i].

- **Obligatory subject-auxiliary inversion** in direct questions with object extraction:

- (15) a. What_i **does** John read ___i?
b. *What_i John **does** read ___i?
c. *What_i John reads ___i?

- **No subject-auxiliary inversion** in topicalization:

- (16) a. *This report_i **does** John read ___i.
b. This report_i John **does** read ___i.

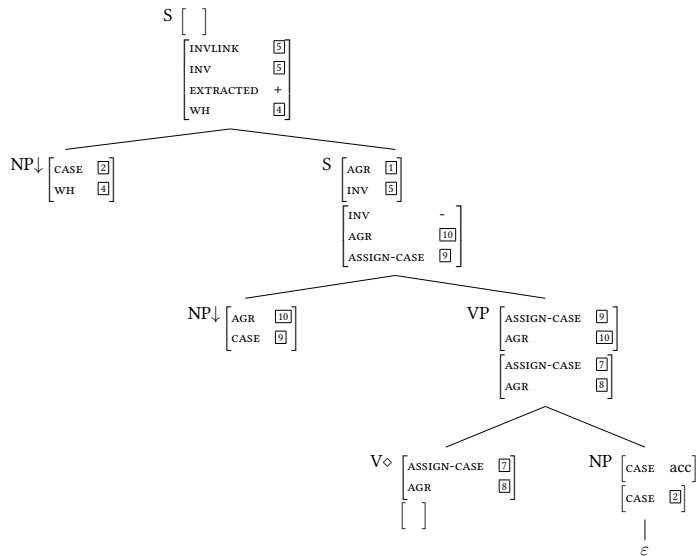
Subject-auxiliary inversion - XTAG-analysis (1)

Features for extraction:

- $\text{extracted} := \{+, -\}$
 - \Rightarrow to indicate extraction in the S-node
- $\text{wh} := \{+, -\}$
 - \Rightarrow to indicate the presence of a wh-pronoun
- $\text{inv} := \{+, -\}$
 - \Rightarrow to indicate inversion
- $\text{inmlink} := \{+, -\}$
 - \Rightarrow to link wh und inv via the **root restriction**

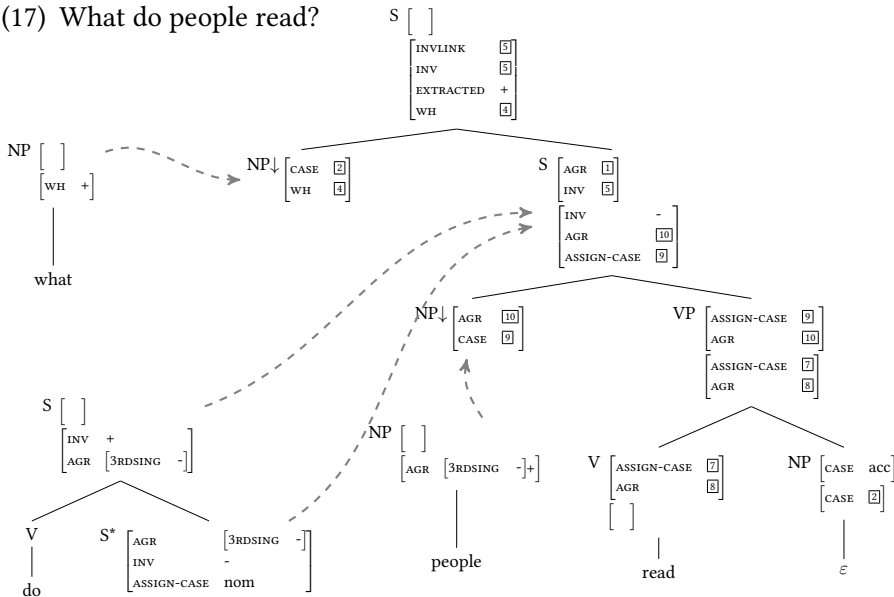
Subject-auxiliary inversion - XTAG-analysis (2)

Tree template for object extraction (simplified):

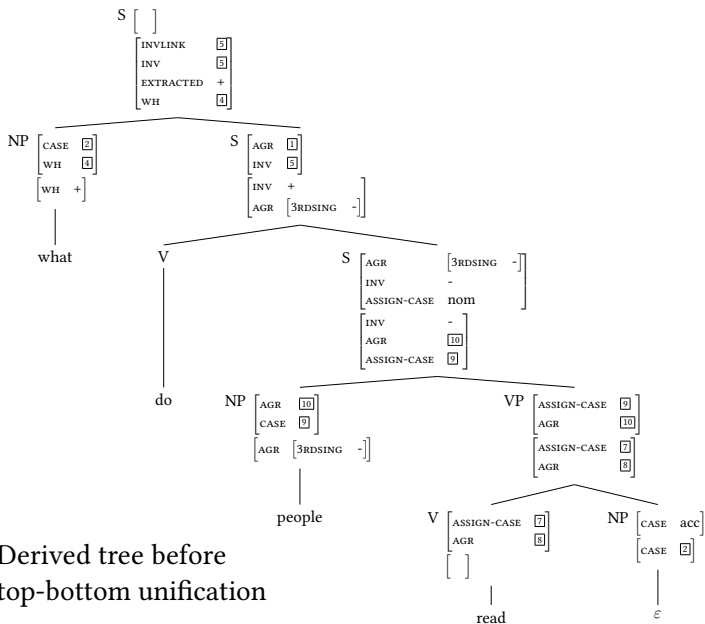


Subject-auxiliary inversion - XTAG-analysis (3)

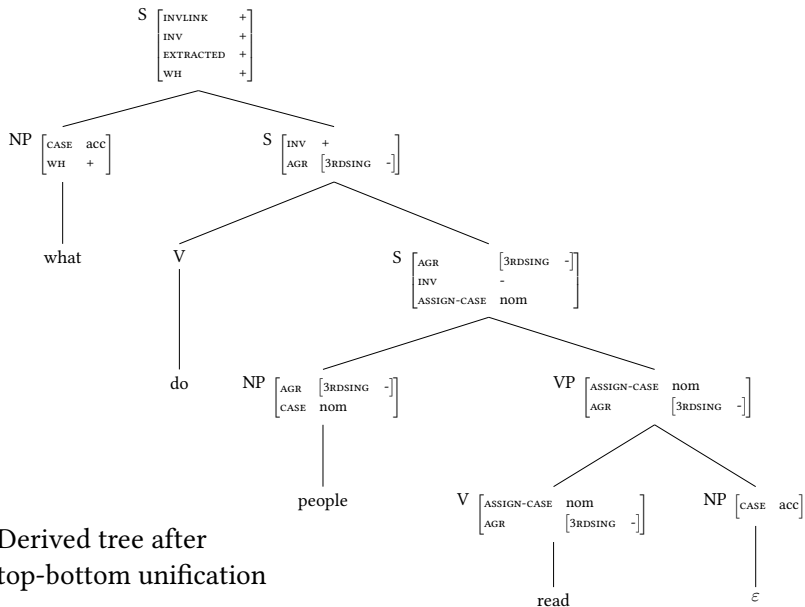
(17) What do people read?



Subject-auxiliary inversion - XTAG-analysis (4)



Subject-auxiliary inversion - XTAG-analysis (5)



Subject-auxiliary inversion - XTAG-analysis (6)

- **No subject-auxiliary inversion** in embedded wh-questions:
 - ⇒ The governing verb selects a sentential complement with $inv = -$ in the root node.
- **Obligatory subject-auxiliary inversion** in direct questions:
 - ⇒ In the root node: $wh = +, inv = +$
- **No subject-auxiliary inversion** in topicalization:
 - ⇒ In the root node: $wh = -, inv = -$

Problem

How to impose that $wh = inv$ in non-embedded object extraction, without including embedded sentences or subject extraction?

Subject-auxiliary inversion - XTAG-analysis (7)

Root restriction

“A restriction is imposed on the **final root node** of any XTAG derivation of a tensed sentence which equates the wh feature and the invlink feature of the final root node.” (XTAG Research Group, 2001, 296)

Crucial difference:

- The trees for object extraction have the invlink.
- The trees for subject extraction do not have the invlink.

Effects:

- Only in non-embedded object extractions the wh-pronoun depends on inversion and vice versa.
- The same tree can be used for embedded and non-embedded object extraction.

Relative clauses - Basics

“Relative clauses are NP modifiers involving extraction of an argument or an adjunct” (XTAG manual)

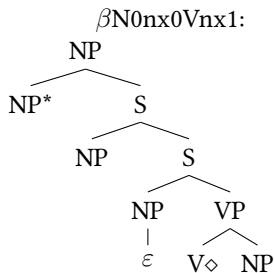
- (18) a. the dog [which ate the cake] (wh-relatives)
b. the export exhibition [Muriel planned] (wh-less relatives)
c. [What_i Sandy loves ___i] is Kim. (free wh-relatives)
d. the girl [reading the magazine] (gerunds ???)
- (19) Somebody_i lives nearby [who has a CD-burner]_i. (extraposition)

⇒ **internal vs. external syntax**

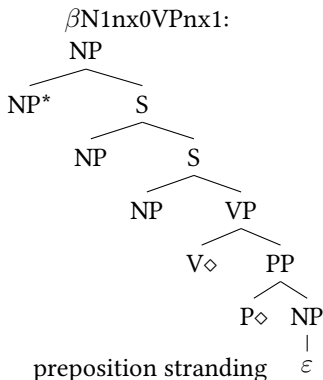
Relative clauses - XTAG-analysis (1) - Wh/that-relatives

- (20) a. The dog_i [that_i ate the cake] (subject extraction)
b. The person_i [who_i I talked to _i]. (preposition stranding)

internal syntax: same as wh-extraction
external syntax: adjunction at a NP-node



subject extraction

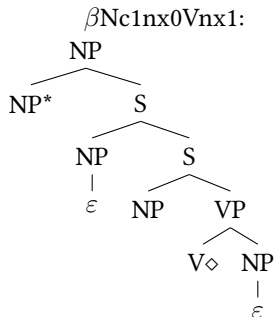


preposition stranding

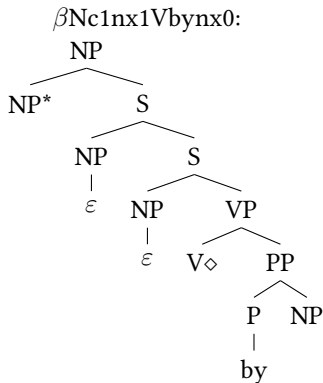
Relative clauses - XTAG-analysis (2) - Wh-less relatives

- (21) a. the export exhibition [Muriel planned/is planning]
b. the export exhibition [(being) planned by Muriel]

internal syntax: same as wh-extraction, but missing wh-pronoun
external syntax: adjunction at a NP-node



missing wh-object



missing wh-subject in passive

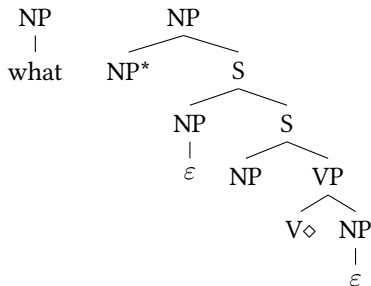
Relative clauses - XTAG-analysis (3) - Free wh-relatives

Also known as **Pseudoclefts** !

(22) [What_i Sandy loves ___i] is Kim_i.

internal syntax: same as wh-less relative clause

external syntax: adjunction at a wh-pronoun



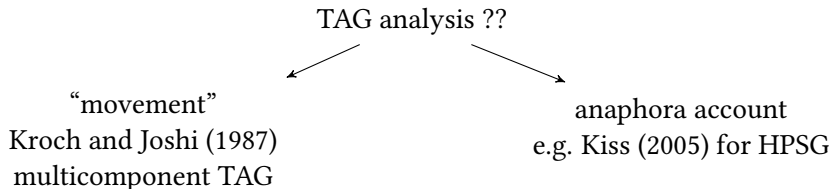
\Rightarrow XTAG covers only free wh-relatives in object position!

Extraposited relative clauses

- (23) a. Somebody_i lives nearby [who_i has a CD-burner].
b. Karl hat mir [von der Kopie [einer Fälschung [eines Bildes [einer Frau _i]]]] erzählt, [die schon lange tot ist]_i.

internal syntax: same as wh-extraction

external syntax: no adjunction at a NP-node, but to the right periphery of the sentence



Extraction - Summary

- Topicalization and wh-extraction obtain a uniform analysis.
- Account for unbounded dependency via extended domain of locality + factoring of recursion
- Island constraints can be modelled rather naturally (wrt. TAG).
- Relative clauses are realized as auxiliary trees. Their internal structure is analysed as ordinary wh-extraction.

- Kiss, T. (2005). Semantic constraints on relative clause extraposition. Natural Language and Linguistic Theory, 23:281–334.
- Kroch, A. S. and Joshi, A. K. (1987). Analyzing extraposition in a Tree Adjoining Grammar. In Huck, G. J. and Ojeda, A. E., editors, Discontinuous Constituency, number 20 in Syntax and Semantics, pages 107–149. Academic Press, Inc.
- XTAG Research Group (2001). A Lexicalized Tree Adjoining Grammar for English. Technical report, Institute for Research in Cognitive Science, University of Pennsylvania, Philadelphia, PA.