Introduction to the seminar
Locality of Grammatical Relations

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Overview

- Introduction
  - The traditional HPSG architecture
  - Locality of grammatical relations
- Empirical arguments for extending domains of traditionally local grammatical relations for
  - syntactic properties (case, subject-verb agreement, . . .)
  - semantic properties (semantic index)

The HPSG paradigm and the issue of locality

- The main building blocks of HPSG grammars (Pollard and Sag, 1994)
  - from a linguistic perspective
  - from a formal perspective
- Locality of grammatical relations in HPSG

HPSG grammars from a linguistic perspective

From a linguistic perspective, an HPSG grammar consists of

- a lexicon licensing **basic words**
- lexical rules licensing **derived words**
- immediate dominance (ID) schemata licensing **constituent structure**
- linear precedence (LP) statements constraining **word order**
- a set of implicational grammatical principles expressing **generalizations about linguistic objects**

Basic lexicon

$$word \rightarrow \left[\begin{array}{ll}\text{PHON} & \langle she \rangle \\ \text{SYNSEM} & \left[\text{LOC} \left[\begin{array}{ll}\text{CAT} & \left[\begin{array}{ll}\text{HEAD} & \left[\begin{array}{ll} noun \\ \text{CASE} & nom\end{array}\right] \\ \text{SUBCAT} & \langle\rangle\end{array}\right] \\ \text{CONT} & \left[\begin{array}{ll} ppro \\ \text{INDEX} & \left[\begin{array}{ll}\text{PER} & 3rd \\ \text{NUM} & sing \\ \text{GEND} & fem\end{array}\right]\end{array}\right]\end{array}\right]\right]\end{array}\right]$$

$$\vee \left[\begin{array}{ll}\text{PHON} & \langle painted \rangle \\ \text{SYNSEM} & \left[\text{LOC} \left[\begin{array}{ll}\text{CAT} & \left[\begin{array}{ll}\text{HEAD} & \left[\begin{array}{ll} verb \\ \text{VFORM} & psp\end{array}\right] \\ \text{SUBCAT} & \left\langle NP[nom]_{\boxed{1}},\ NP[acc]_{\boxed{2}} \right\rangle\end{array}\right] \\ \text{CONT} & \left[\begin{array}{ll} paint \\ \text{PAINTER} & \boxed{1} \\ \text{PAINTED} & \boxed{2}\end{array}\right]\end{array}\right]\right]\end{array}\right]$$

Lexical Rules

A passive lexical rule (based on Pollard and Sag, 1987, p.215):

$$\left[\text{SYNSEM|LOC|CAT} \left[\begin{array}{ll}\text{HEAD} & \left[\begin{array}{ll} verb \\ \text{VFORM} & psp\end{array}\right] \\ \text{SUBCAT} & \left\langle \text{NP}_{\boxed{1}},\ \text{NP}_{\boxed{2}} \right\rangle \oplus \boxed{3}\end{array}\right]\right] \mapsto$$

$$\left[\text{SYNSEM|LOC|CAT} \left[\begin{array}{ll}\text{HEAD} & \left[\begin{array}{ll} verb \\ \text{VFORM} & pas\end{array}\right] \\ \text{SUBCAT} & \left\langle \text{NP}_{\boxed{2}} \right\rangle \oplus \boxed{3} \oplus \left\langle \left(\text{PP[by]}_{\boxed{1}} \right) \right\rangle\end{array}\right]\right]$$

ID Schemata and LP Statements

ID Schemata

Example: The Head-Complement Schema (Pollard and Sag, 1994, p.402)

$$\left[\begin{array}{ll} phrase \\ \text{DTRS} & headed\text{-}structure\end{array}\right] \rightarrow \left[\begin{array}{ll}\text{SYNSEM|LOC|CAT|SUBCAT} & \langle synsem \rangle \\ \text{DTRS} & \left[\begin{array}{ll} head\text{-}comp\text{-}struc \\ \text{HEAD-DTR} & word\end{array}\right]\end{array}\right]$$

$$\vee \ldots$$

LP Statements

Example: A restriction on the linearization of indefinite NPs in the German Mittelfeld (based on Lenerz, 1977; cf. also topol. fields in Kathol, 2000)

NP[dat] $<$ NP[acc,indef]

General grammatical principles

Example 1: The Head-Feature Principle (Pollard and Sag, 1994, p.399)

$$\left[\begin{array}{ll} phrase \\ \text{DTRS} & headed\text{-}struc\end{array}\right] \rightarrow \left[\begin{array}{ll}\text{SYNSEM|LOC|CAT|HEAD} & \boxed{1} \\ \text{DTRS|HEAD-DTR|SYNSEM|LOC|CAT|HEAD} & \boxed{1}\end{array}\right]$$

Example 2: The Clausal Rel Prohibition (Pollard and Sag, 1994, p.401)

$$\left[\begin{array}{ll} synsem \\ \text{LOC|CAT} & \left[\begin{array}{ll}\text{HEAD} & verb \\ \text{SUBCAT} & \langle\rangle\end{array}\right]\end{array}\right] \rightarrow \left[\text{NONLOC|INHER|REL} \{\}\right]$$

HPSG grammars from a formal perspective

From a formal perspective (SRL, King 1989, 1994), a grammar consists of:

- The signature as declaration of the linguistic ontology
  - type hierarchy (which kind of objects exist)
  - appropriateness conditions (which objects have which properties)
- The theory constraining the domain
  - A theory is a set of description language statements, the constraints.
  - A linguistic object is grammatical (admissible with respect to a theory) iff it satisfies each of the descriptions in the theory and so does each of its substructures.

More on theories in the formal sense

A theory is a set of description language statements, the constraints, which single out the grammatical objects from the ungrammatical ones.

- The description language statements consist of:
  - type assignment, path equality
  - conjunction, disjunction, negation
- Most of the theory – Lexicon, ID Schemata, and Principles – is already expressed using such statements.
- Other components can be formalized on this logical basis: LP statements (Richter and Sailer, 1995), Lexical Rules (Meurers, 1995, 2001)
- An extension of SRL including relations and explicit quantification is provided in RSRL (Richter 1997, 1999, Richter et al. 1999).

Locality of grammatical relations in HPSG

1. local to lexical head of head domain
2. local to part of head domain, between lexical head and realized dependent
3. local to entire head domain
4. local to a lexically extended head domain
5. not generally local to a domain

Locality of grammatical relations in HPSG
local to lexical head of head domain

Binding (principles A and B): local o-command expressed in terms of properties only present in lexical head of head domain

Example:

(1) a. Sandy$_i$ gives her$_j$ some cake. (i $\neq$ j)
    b. Sandy$_i$ gives herself$_i$ some cake.

Example for lexical head of a head domain

$$\begin{bmatrix} \text{PHON } \langle gives \rangle \\ \text{SYNSEM|LOCAL} \begin{bmatrix} \text{CAT|SUBCAT} \left\langle NP_{\boxed{1}}, NP_{\boxed{2}}, NP_{\boxed{3}} \right\rangle \\ \text{CONT} \begin{bmatrix} give' \\ \text{GIVER } \boxed{1} \\ \text{GIFT } \boxed{2} \\ \text{GIVEN } \boxed{3} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Each subcategorization requirement (e.g., *NP* above) is only a partial representation of the realized argument; it does not include information on:

- phonological or morphological realization
- lexical or phrasal nature of the argument
- internal constituent structure of the argument

Locality of grammatical relations in HPSG
local to part of head domain, between lexical head and realized dependent

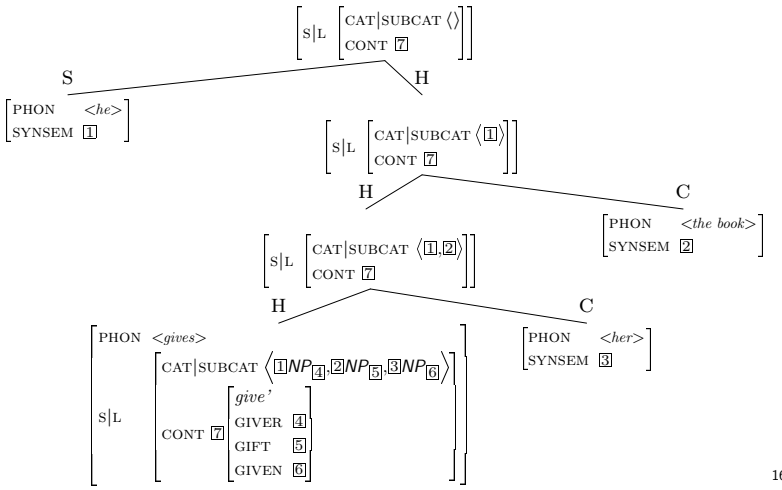
- syntactic properties of dependent:
  - government[1] phenomena: case assignment, . . .
  - agreement[2] phenomena: subject-verb agreement, . . .

[1] government: A head selects properties of its complement which are not properties of the head itself.
[2] agreement: Two elements in a head domain exhibit the same morphological properties.

Locality of grammatical relations in HPSG
local to entire head domain

- semantic properties (relations, roles and indices):
  - argument realization
  - modifier realization
- syntactic head properties of lexical head: selection

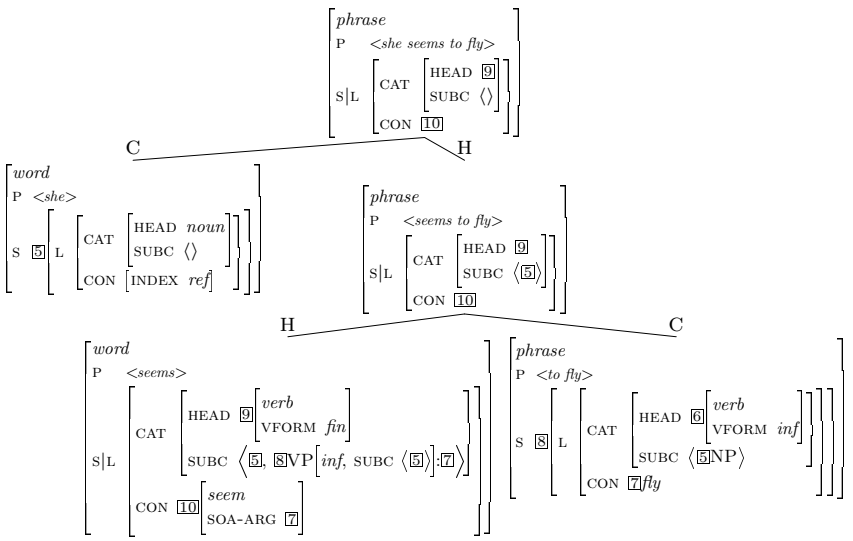
Example for a head domain



Locality of grammatical relations in HPSG
local to a lexically extended head domain

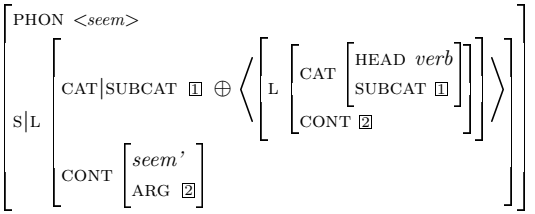
- argument attraction: coherence (Germanic), restructuring (Romance)
- control phenomena: raising and equi

Example tree with lexically extended head domain



Example for a lexically extended head domains: Raising

The subject valence requirement of the subject raising verb is identified with the subject of the verbal complement.

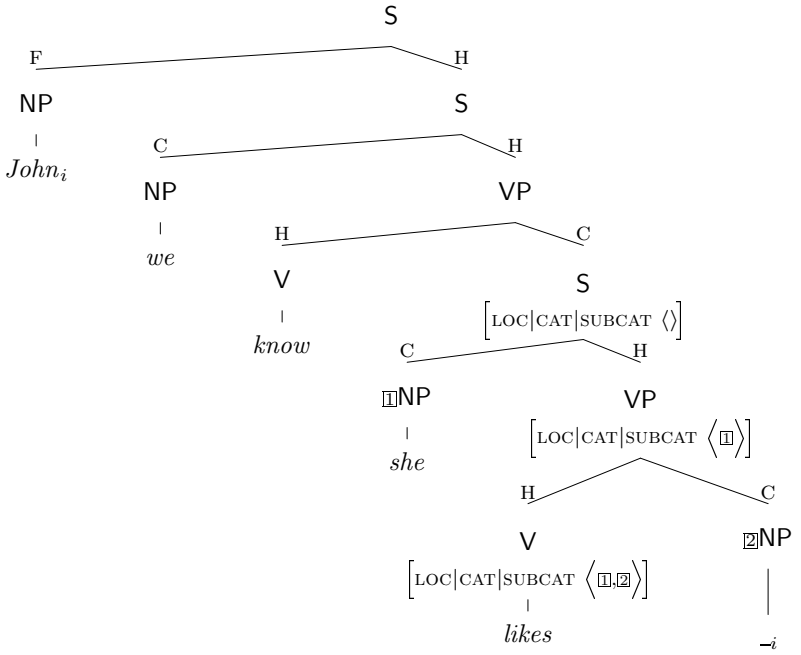


Locality of grammatical relations in HPSG
not generally local to a domain

- topicalization
  - filler↔gap (SLASH)
- *wh*-questions
  - filler↔gap (SLASH)
  - *wh*-word↔*wh*-phrase (QUE)
- relative clauses
  - filler↔gap (SLASH)
  - relative pronoun↔relative phrase (REL)

- binding (principle C)
  - binder↔referring expression (recursive o-command definition)
- interpretation of quantifiers
  - occurrence↔interpretation (QSTORE, RETRIEVED)
- extraposition? (cf. Kathol and Pollard, 1995; Keller, 1994, 1995; Kiss, 1998)

An example for an unbounded dependency



Guiding questions

What?

- Which properties need to be accessible/visible?
  - syntactic: case, agreement, . . . ; semantic: index, . . .
- For which elements is a particular property visible?
  - only of subjects, of all arguments, of all dependents

Which domain?

- How far is a particular property visible?
  - only in lexical head
  - between lexical head and realized element
  - entire head domain
  - sequence of multiple head domains
  - no generally restricted domain

Guiding questions (cont.)

When?

- When does the property become visible in which of the domains?
  - presence of a trigger: lexical or constructional
  - always

Theoretical interpretation

- Which representations and percolation principles should be used to make these properties visible?
- How are the representations integrated into the grammatical relations once they are visible?

Empirical arguments in the literature
syntactic properties

- Bender and Flickinger (1999a,b):
  - Tag questions in English
  - Richard phenomenon
- Höhle (1994, 1995, 1997):
  - complementizer agreement in Eastern Dutch dialects
  - agreement in gapless relative clauses in German
  - case assignment in English *for-to* infinitives
- Meurers (1999, 2000); Kathol (2003):
  - Apparently non-local case assignment and agreement in German
- Przepiórkowski (1999):
  - Raising across prepositions in Polish
  - Case agreement with numeral phrases in Polish

Empirical arguments in the literature
semantic properties

- Baxter (1999) and Johnston (1999): English Purpose Infinitives
- Levine (2000): English *tough* constructions
- Kolliaou and Alexopoulou (1999): Information Structure Instantiation Constraint for link values of Clitic Left Dislocation phenomenon in Greek

Related arguments in the literature
relations between co-dependents within head domain

Semantic:

- Kiss (2001): determining quantifier scope in German using ARG-ST

Syntactic:

- Przepiórkowski (1999): case assignment on ARG-ST

Morphosyntactic:

- Kathol (1999): agreement phenomena based on new AGR architecture. (Kathol's new AGR setup forms the basis of Bender and Flickinger 1999a,b and is used as supportive evidence in Meurers 1999).

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