Local Semantics in Head-Driven Phrase Structure Grammar

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1 Introduction

1.1 Local Phenomena

What are local phenomena?

- Syntax: determined within one phrase:
  subcategorization (categorial selection), case assignment, in some theories: binding.
- Semantics:
  selection (selectional restrictions), thematic role assignment
- Syntax-Semantics interface:
  linking, argument structure alternations
- General characterization:
  - determined by lexical properties
  - concern the direct relation between a head and its dependents

Non-local phenomena

- Syntax:
  extraction/ unbounded dependencies, pied-piping, scrambling?
- Semantics:
  scope interaction, focus
- General characterization
  - largely independent of idiosyncratic head-dependent relations
  - concern structural rather than lexical properties

1.2 Locality in HPSG

(1) Architecture of a linguistic sign according to Pollard and Sag (1994) (Pollard and Yoo, 1998):

$$\left[\begin{array}{ll} \multicolumn{2}{l}{\textit{phrase}} \\ \textsc{phon} & \text{phonological structure} \\ \textsc{synsem} & \left[\begin{array}{ll} \multicolumn{2}{l}{\textit{synsem}} \\ \textsc{local} & \left[\begin{array}{ll} \textsc{category} & \left[\begin{array}{ll} \textsc{head} & \text{part of speech, case, \ldots} \\ \textsc{valence} & \text{valence} \\ \textsc{arg-st} & \text{argument structure} \end{array}\right] \\ \textsc{content} & \left[\begin{array}{ll} \multicolumn{2}{l}{\text{semantic structure}} \\ \textsc{quants} & \text{list of scopal elements} \\ \textsc{nucl} & \text{main predicate} \\ \textsc{store} & \text{quantifier store} \end{array}\right] \end{array}\right] \\ \textsc{nonlocal} & \text{pied-piping} \end{array}\right] \\ \textsc{dtrs} & \text{constituent structure} \end{array}\right]$$

- Only *synsem* objects occur on the argument structure and on the valence lists.
- A selector cannot determine the phonological properties or the syntactic structure of the selected element.
- But: all of the semantics is there!

Why HPSG?

- rigidly formalized framework
- analysis for local and non-local semantic phenomena available
- the modular structure of a linguistic sign makes the discussed distinctions especially transparent.

2 Local Semantics

Argument: for an account of local semantic phenomena:

- argument structure, semantic hierarchies, ... are relevant.
- but no reference needs to be made to operator or quantifier scope.

2.1 Linking

Linking: the mapping between semantic roles and syntactic complements

(2) a. Pat moved the car.

b.
$$\left[\begin{array}{ll} \multicolumn{2}{l}{\textit{word}} \\ \textsc{phon} & \langle \textit{moved} \rangle \\ \textsc{syns} & \left[\textsc{loc} \left[\begin{array}{ll} \textsc{cat} & \left[\begin{array}{ll} \textsc{head} & \textit{verb} \\ \textsc{arg-st} & \left\langle \boxed{1}\left[\textsc{loc cont index } \boxed{1'}\right], \boxed{2}\left[\textsc{loc cont index } \boxed{2'}\right] \right\rangle \\ \textsc{val} & \left[\begin{array}{ll} \textsc{subj} & \langle \boxed{1} \rangle \\ \textsc{comps} & \langle \boxed{2} \rangle \end{array}\right] \end{array}\right] \\ \textsc{cont} & \left[\textsc{nucl} \left[\begin{array}{ll} \multicolumn{2}{l}{\textit{move-rel}} \\ \textsc{actor} & \boxed{1'} \\ \textsc{undergoer} & \boxed{2'} \end{array}\right]\right] \end{array}\right]\right] \end{array}\right]$$

(3) Linking, we claim, consists of a classification of words constraining the relations that can exist between (the type of) semantic content of verbs and (the type of) their subcategorization structure. [...] Crucially, the linking constraints that map from semantic attribute to the subject and object reference both the semantic attributes and the list of syntactic dependents or ARG-ST list. (Davis and Koenig, 2000)

(4) Linking constraint (à la Koenig and Davis (2003)):

$$\left[\textsc{syns loc} \left[\begin{array}{ll} \textsc{cat} & \left[\textsc{arg-st} \left\langle \text{NP, NP, \ldots} \right\rangle\right] \\ \textsc{cont} & \left[\textsc{nucleus } \textit{cause-rel}\right] \end{array}\right]\right] \Rightarrow \left[\textsc{syns loc} \left[\begin{array}{ll} \textsc{cat} & \left[\textsc{arg-st} \left\langle \left[\textsc{loc cont index } \boxed{1}\right], \ldots \right\rangle\right] \\ \textsc{cont} & \left[\textsc{nucleus} \left[\textsc{actor } \boxed{1}\right]\right] \end{array}\right]\right]$$

(where *move-rel* is a subsort of *cause-rel*)

Linking theory predicts the lack of a verb *hypdraw* such that the following two sentences have the same meaning:

(5) a. John drew a picture.

b. *A picture hypdrew John.

Locality

- The linking properties of a verb do not depend on semantic operators such as the quantificational nature of the complements or tense operators.
- Linking constraints à la Koenig and Davis (2003) are not constrained in this way:

  (6) Hypothetical linking constraint:
  if the first argument contains a universal quantifier, then ...

  $$\left[\textsc{syns loc} \left[\begin{array}{ll} \textsc{cat} & \left[\textsc{arg-st} \left\langle \left[\textsc{loc cont store } \left\langle \left[\textit{forall}\right] \right\rangle\right], \ldots \right\rangle\right] \\ \textsc{cont} & \left[\textsc{nucleus } \textit{cause-rel}\right] \end{array}\right]\right] \Rightarrow \quad \ldots$$

- An adequate architecture of grammar should forbid the formulation of this kind of linking constraints.

2.2 Semantic Restrictions

2.2.1 Sortal Restrictions

(7) a. Die Zeitung wird neu gegründet. (institution, object)
'The newspaper is re-founded.'

b. Die Zeitung liegt auf dem Tisch. (thing, object)
'The newspaper is lying on the table.'

c. Die Zeitung wird verkauft. (thing or institution, object)
'The newspaper is being sold.' (Dölling, 1994)

The ontology is the result of a cross-classification according to the following three domains (Dölling, 1994):

(8) a. 2 domains: kind, object

b. 6 disjunct subdomains: thing, institution, group, configuration, person, material

c. 2 subdomains: singular individual, plural individual

Dölling defines shifting rules between the domains, similar to Partee (1987) ("kind-of" operator "$\cup$"):

(9) a. This house has been every color

b. $\forall x[\mathsf{color}'(x) \rightarrow {}^{\cup}x(h)]$
(For each x: if x is a color, then this house has been x)

Influence on binding:

(10) a. Das Institut steht in der Wilhelmstraße.
'The institute is situated at Wilhelmstraße.'
(institution → thing (location of), object)

b. Das Institut trifft sich zum Mittagessen.
'The institute meets for lunch.'
(institution → person, plural (associated with)

c. [Das Institut]$_i$ steht in der Wilhelmstraße. *Es$_i$ trifft sich regelmäßig zum Mittagessen.
'The institute is situated at Wilhelmstraße. It regularly meets for lunch.'

d. Hans kauft [einen Löwen]$_i$, weil *er$_i$/ [dieses Tier]$_i$ vom Aussterben bedroht ist.
'Hans is buying a lion, because *it/ this animal is in danger of extinction.'

Locality

- Lexical semantic properties of the words play a role, but not their quantificational or scopal behavior.
- There is interaction with binding.
- The shifting rules are independent of the quantificational nature of a noun.

2.2.2 Selectional Restrictions

(11) a. Hans plückte einen Löwenzahn.
Hans picked a dandelion

b. ?? Hans plückte ein Buch aus dem Regal.
Hans picked a book from the shelve

(12) Binnen de GG wordt een zin waarin selectie-restricties worden geschonden echter niet opgevat als ongrammaticaal: in dergelijke zinnen wordt niet een structurele regel geschonden, maar hebben we te maken met een schending van eisen die we kennen op grond van onze kennis van de buitentalige werkelijkheid. Voor dit soort kennis hoeft geen verklaring te worden gegeven in de grammatica. (Bennis and Hoekstra, 1989, p. 23)

Within generative grammar a sentence in which selectional restrictions are violated is not considered ungrammatical: in such a sentence no structural rule is violated, instead we are dealing with a violation of constraints which we know by our knowledge of the non-linguistic reality. For this kind of knowledge, no explanation needs to be given within the grammar.

Repairing contexts:

- negation and modals:

(13) a. ?? Tom ate a keyboard.
b. Tom cannot eat a keyboard. (Androutsopoulos and Dale, 2000)

- meta-linguistic comments:

(14) a. it is nonsense to speak of (there is no activity as) elapsing a book
b. elapsing a book is not an activity that can be performed
c. one cannot elapse a book (Chomsky, 1965, p. 158)

Independent of quantifiers or other semantic operators:

(15) Hans hat zwei/ alle Pusteblumen geplückt/ pflücken wollen.
Hans has two/ all dandelions picked/ pick want
'Hans picked/ wanted to pick two/ all dandelions.'

Note: Selectional restrictions differ from sortal restrictions (see Lang (1994)):

- Selectional restrictions are more fine-grained.
- The distinction between sortal and selectional restrictions can be a solution to the two levels of semantic features in Chomsky (1965).
- Selectional restrictions interact with binding to a lesser degree than sortal restr.:

(16) Hans pflückte das Buch und las es gleich darauf.
'Hans picked the book(*thing*) and read it(*thing*) immediately.'

Locality

- The effect of quantifiers, negation or modal operators is not part of the idiosyncratic semantic restrictions of a verb.
- Within the architecture in (1) such restrictions could be formulated:

(17) Part of a hypothetical lexical entry:
A word which requires its first argument to contain a universal quantifier

$$\left[\textsc{synsem loc}\ \left[\textsc{cat}\ \left[\textsc{arg-st}\ \left\langle \left[\textsc{loc cont store}\ \left\langle \left[\textit{forall}\right]\right\rangle\right], \ldots \right\rangle\right]\right]\right]$$

3 Lexical Resource Semantics

General remarks:

- LRS uses techniques of *underspecified semantics* (Reyle, 1993; Bos, 1996), but the logical form of a sentence is a single, disambiguated expression of the semantic representation language (Sailer, 2003a).
- Previous LRS publications discuss scope ambiguity (Richter and Sailer, 2001a; Bouma, 2003), negative concord (Richter and Sailer, 2001b) and multiple wh-interrogatives in German (Richter and Sailer, 2001a).
- Richter and Sailer (2003) provides an introduction to LRS.

(18) The architecture of semantics:

$$\begin{bmatrix} \textit{phrase} & \\ \textsc{phon} & \text{phonological structure} \\ \textsc{synsem} & \begin{bmatrix} \textit{synsem} & \\ \textsc{local} & \begin{bmatrix} \textsc{category} & \begin{bmatrix} \textsc{head} & \text{part of speech, case, \ldots} \\ \textsc{valence} & \text{valence} \\ \textsc{arg-st} & \text{argument structure} \end{bmatrix} \\ \textsc{content} & \begin{bmatrix} \textbf{local semantic structure} & \\ \textsc{index} & \begin{bmatrix} \textsc{phi} & \phi\text{-features} \\ \textsc{var} & \text{logical variable} \end{bmatrix} \\ \textsc{main} & \text{semantic constant} \end{bmatrix} \end{bmatrix} \\ \textsc{nonlocal} & \text{pied-piping} \end{bmatrix} \\ \textsc{logical-form} & \left[\textbf{logical expressions associated with the sign}\right] \\ \textsc{dtrs} & \text{constituent structure} \end{bmatrix}$$

3.1 Nonlocal Semantics

(19) a. The value of LOGICAL-FORM:

$$\begin{bmatrix}\text{EXTERNAL-CONTENT} & \text{at utterances: the overall logical form}\\ \text{INTERNAL-CONTENT} & \text{the scopally lowest expression of the sign}\\ \text{PARTS} & \text{all expressions contributed by a sign}\end{bmatrix}$$

b. The LF values:

everyone

$$\begin{bmatrix}\text{EX-CONT} & \forall x[\alpha \to \beta]\\ \text{IN-CONT} & \mathsf{human}'(x)\\ \text{PARTS} & \langle \forall x[\alpha \to \beta], \alpha \to \beta, \mathsf{hum}'(x)\rangle\end{bmatrix}$$

and $\mathsf{hum}'(x) \triangleleft \alpha$

loves

$$\begin{bmatrix}\text{EX-CONT} & \gamma\\ \text{IN-CONT} & \mathsf{love}'(e,x,y)\\ \text{PARTS} & \langle \mathsf{love}'(e,x,y)\rangle\end{bmatrix}$$

something

$$\begin{bmatrix}\text{EX-CONT} & \exists y[\delta \wedge \epsilon]\\ \text{IN-CONT} & \mathsf{object}'(y)\\ \text{PARTS} & \langle \exists y[\delta \wedge \epsilon], \delta \wedge \epsilon, \mathsf{obj}'(y)\rangle\end{bmatrix}$$

and $\mathsf{obj}'(y) \triangleleft \delta$

(20) SEMANTICS PRINCIPLE:

- The values of EX-CONT and IN-CONT are identical on the mother and the head.
- The PARTS value of the mother is the union of the PARTS values of the daughters.
- Structure-dependent constraints:
  - If the nonhead is a quantified NP complement of the head, then the head's IN-CONT is a subexpression of the nonhead's nuclear scope.
  - ...

(21) a. Everyone loves something.

b.

S

$$\begin{bmatrix}\text{EX-CONT} & \gamma\\ \text{IN-CONT} & \mathsf{love}'(e,x,y)\\ \text{PARTS} & \langle \mathsf{love}'(e,x,y), \exists y[\delta \wedge \epsilon], \delta \wedge \epsilon, \mathsf{obj}'(y), \forall x[\alpha \to \beta], \alpha \to \beta, \mathsf{hum}'(x)\rangle\end{bmatrix}$$

$\mathsf{love}'(e,x,y) \triangleleft \beta$

NP

$$\begin{bmatrix}\text{EX-CONT} & \forall x[\alpha \to \beta]\\ \text{IN-CONT} & \mathsf{human}'(x)\\ \text{PARTS} & \langle \forall x[\alpha \to \beta], \alpha \to \beta, \mathsf{hum}'(x)\rangle\end{bmatrix}$$

$\mathsf{hum}'(x) \triangleleft \alpha$

everyone

VP

$$\begin{bmatrix}\text{EX-CONT} & \gamma\\ \text{IN-CONT} & \mathsf{love}'(e,x,y)\\ \text{PARTS} & \langle \mathsf{love}'(e,x,y), \exists y[\delta \wedge \epsilon], \delta \wedge \epsilon, \mathsf{obj}'(y)\rangle\end{bmatrix}$$

$\mathsf{love}'(e,x,y) \triangleleft \epsilon$

V

$$\begin{bmatrix}\text{EX-CONT} & \gamma\\ \text{IN-CONT} & \mathsf{love}'(e,x,y)\\ \text{PARTS} & \langle \mathsf{love}'(e,x,y)\rangle\end{bmatrix}$$

loves

NP

$$\begin{bmatrix}\text{EX-CONT} & \exists y[\delta \wedge \epsilon]\\ \text{IN-CONT} & \mathsf{object}'(y)\\ \text{PARTS} & \langle \exists y[\delta \wedge \epsilon], \delta \wedge \epsilon, \mathsf{obj}'(y)\rangle\end{bmatrix}$$

$\mathsf{obj}'(y) \triangleleft \delta$

something

c. Readings:

- $\forall\exists$-reading: $\forall x[\mathsf{hum}'(x) \to \exists y[\mathsf{obj}'(y) \wedge \mathsf{love}'(e,x,y)]]$
- $\exists\forall$-reading: $\exists y[\mathsf{obj}'(y) \wedge \forall x[\mathsf{hum}'(x) \to \mathsf{love}'(e,x,y)]]$

3.2 Local Semantics

(22) a. Outline of the lexical entry of *everyone*:

$$\begin{bmatrix}\text{PHON} & \langle \textit{everyone}\rangle\\ \text{SYNS} & \begin{bmatrix}\text{LOC} & \begin{bmatrix}\text{CAT} & \begin{bmatrix}\text{HEAD} & \textit{noun}\\ \text{ARG-ST} & \langle\rangle\end{bmatrix}\\ \text{CONT} & \begin{bmatrix}\text{INDEX} & \begin{bmatrix}\text{PHI} & \begin{bmatrix}\text{NUM} & \textit{sg}\\ \text{PERS} & \textit{3rd}\end{bmatrix}\\ \text{VAR} & x\end{bmatrix}\\ \text{MAIN} & \mathsf{human}'\end{bmatrix}\end{bmatrix}\end{bmatrix}\\ \text{LF} & \begin{bmatrix}\text{EX-CONT} & \forall x[\alpha \to \beta]\\ \text{IN-CONT} & \mathsf{human}'(x)\\ \text{PARTS} & \langle \forall x[\alpha \to \beta], \alpha \to \beta, \mathsf{hum}'(x)\rangle\end{bmatrix}\end{bmatrix}$$

and $\mathsf{human}'(x) \triangleleft \alpha$

b. Outline of the lexical entry of *loves*:

$$\begin{bmatrix}\text{PHON} & \langle \textit{loves}\rangle\\ \text{SYNS} & \begin{bmatrix}\text{LOC} & \begin{bmatrix}\text{CAT} & \begin{bmatrix}\text{HEAD} & \textit{verb}\\ \text{ARG-ST} & \left\langle \begin{bmatrix}\text{LOC} & \begin{bmatrix}\text{CAT} & [\text{HEAD } \textit{noun}]\\ \text{CONT} & [\text{INDEX VAR } x]\end{bmatrix}\end{bmatrix}, \begin{bmatrix}\text{LOC} & \begin{bmatrix}\text{CAT} & [\text{HEAD } \textit{noun}]\\ \text{CONT} & [\text{INDEX VAR } y]\end{bmatrix}\end{bmatrix}\right\rangle\end{bmatrix}\\ \text{CONT} & \begin{bmatrix}\text{INDEX} & [\text{VAR } e]\\ \text{MAIN} & \mathsf{love}'\end{bmatrix}\end{bmatrix}\end{bmatrix}\\ \text{LF} & \begin{bmatrix}\text{EX-CONT} & \gamma\\ \text{IN-CONT} & \mathsf{love}'(e,x,y)\\ \text{PARTS} & \langle \mathsf{love}'(e,x,y)\rangle\end{bmatrix}\end{bmatrix}$$

- Quantifiers and other operators are no longer part of the *synsem* structure, i.e., of what can be selected for.
- The main semantic relation of a word is part of *synsem* (the MAIN value). Thus, it is available for linking.
- Sortal restrictions can be expressed as restrictions on INDEX.
- Selectional restrictions can be expressed with reference to a hierarchy of semantic relations.

4 Apparent Counterexample: Negative Concord

4.1 de Swart and Sag (2002)

(23) Lexical Quantifier Retrieval:

$$\begin{bmatrix}\textit{word}\\ \text{SYNS LOC CAT HEAD } \textit{verb}\end{bmatrix} \Rightarrow \begin{bmatrix}\text{SYNS LOC} & \begin{bmatrix}\text{CAT} & \begin{bmatrix}\text{ARG-ST } \langle [\text{LOC CONT STORE } \Sigma_1], \ldots, [\text{LOC CONT STORE } \Sigma_n]\rangle\end{bmatrix}\\ \text{CONT} & \begin{bmatrix}\text{QUANTS } \mathtt{retrieve}(\Sigma_1 \cup \ldots \cup \Sigma_n)\end{bmatrix}\end{bmatrix}\end{bmatrix}$$

(where $\mathtt{retrieve}$(X) is a series of quantifiers such that each quantifier in X either appears in $\mathtt{retrieve}$(X) or forms a resumptive quantifier with some other quantifier of X)

(24) a. Personne n'aime personne.
nobody NM love nobody

b. No one is such that they love no one.

$$\begin{bmatrix}\text{PHON} & \langle \textit{n'aime}\rangle\\ \text{SYNS LOC} & \begin{bmatrix}\text{CAT ARG-ST} & \langle [\text{LOC CONT STORE } \langle NO_x\rangle], [\text{LOC CONT STORE } \langle NO_y\rangle]\rangle\\ \text{CONT} & \begin{bmatrix}\text{QUANTS} & \langle NO_x, NO_y\rangle\\ \text{NUCL} & Love(x,y)\\ \text{STORE} & \langle\rangle\end{bmatrix}\end{bmatrix}\end{bmatrix}$$

c. No one loves anyone.

$$\begin{bmatrix}\text{PHON} & \langle \textit{n'aime}\rangle\\ \text{SYNS LOC} & \begin{bmatrix}\text{CAT ARG-ST} & \langle [\text{LOC CONT STORE } \langle NO_x\rangle], [\text{LOC CONT STORE } \langle NO_y\rangle]\rangle\\ \text{CONT} & \begin{bmatrix}\text{QUANTS} & \langle NO_{x,y}\rangle\\ \text{NUCL} & Love(x,y)\\ \text{STORE} & \langle\rangle\end{bmatrix}\end{bmatrix}\end{bmatrix}$$

4.2 Negative concord in LRS

(25) Outline of the lexical entry of *personne* (*no one*):

$$\begin{bmatrix}\text{PHON} & \langle \textit{personne}\rangle\\ \text{SYNS} & \begin{bmatrix}\text{LOC} & \begin{bmatrix}\text{CAT} & \begin{bmatrix}\text{HEAD} & \textit{noun}\\ \text{ARG-ST} & \langle\rangle\end{bmatrix}\\ \text{CONT} & \begin{bmatrix}\text{INDEX} & \begin{bmatrix}\text{PHI} & \begin{bmatrix}\text{NUM} & \textit{sg}\\ \text{PERS} & \textit{3rd}\end{bmatrix}\\ \text{VAR} & x\end{bmatrix}\\ \text{MAIN} & \mathsf{human}'\end{bmatrix}\end{bmatrix}\end{bmatrix}\\ \text{LF} & \begin{bmatrix}\text{EX-CONT} & \exists x[\alpha \wedge \beta]\\ \text{IN-CONT} & \mathsf{human}'(x)\\ \text{PARTS} & \langle \exists x[\alpha \wedge \beta], \alpha \wedge \beta, \mathsf{human}'(x), \neg\zeta\rangle\end{bmatrix}\end{bmatrix}$$

and $\mathsf{human}'(x) \triangleleft \alpha$
and $\exists x[\alpha \wedge \beta] \triangleleft \zeta$

(26) a. Personne n'aime personne.

b.

S

$$\begin{bmatrix}\text{EX-CONT} & \gamma \\ \text{IN-CONT} & \mathsf{love}'(e,x,y) \\ \text{PARTS} & \langle \mathsf{love}'(e,x,y), \exists y[\delta \wedge \epsilon], \delta \wedge \epsilon, \mathsf{hum}'(y), \exists x[\alpha \wedge \beta], \alpha \wedge \beta, \mathsf{hum}'(x), \neg\eta, \neg\zeta \rangle \end{bmatrix}$$
$$\mathsf{love}'(e,x,y) \triangleleft \beta$$

NP

$$\begin{bmatrix}\text{EX-CONT} & \exists x[\alpha \wedge \beta] \\ \text{IN-CONT} & \mathsf{human}'(x) \\ \text{PARTS} & \langle \exists x[\alpha \wedge \beta], \alpha \wedge \beta, \mathsf{hum}'(x), \neg\zeta \rangle \end{bmatrix}$$
$$\mathsf{hum}'(x) \triangleleft \alpha \textbf{ and } \exists x[\alpha \wedge \beta] \triangleleft \zeta$$
personne

HEAD

VP

$$\begin{bmatrix}\text{EX-CONT} & \gamma \\ \text{IN-CONT} & \mathsf{love}'(e,x,y) \\ \text{PARTS} & \langle \mathsf{love}'(e,x,y), \exists y[\delta \wedge \epsilon], \delta \wedge \epsilon, \mathsf{hum}'(y), \neg\eta \rangle \end{bmatrix}$$
$$\mathsf{love}'(e,x,y) \triangleleft \epsilon$$

V

$$\begin{bmatrix}\text{EX-CONT} & \gamma \\ \text{IN-CONT} & \mathsf{love}'(e,x,y) \\ \text{PARTS} & \langle \mathsf{love}'(e,x,y) \rangle \end{bmatrix}$$
n'aime

NP

$$\begin{bmatrix}\text{EX-CONT} & \exists y[\delta \wedge \epsilon] \\ \text{IN-CONT} & \mathsf{human}'(y) \\ \text{PARTS} & \langle \exists y[\delta \wedge \epsilon], \delta \wedge \epsilon, \mathsf{hum}'(y), \neg\eta \rangle \end{bmatrix}$$
$$\mathsf{hum}'(y) \triangleleft \delta \textbf{ and } \exists y[\delta \wedge \epsilon] \triangleleft \eta$$
personne

c. Readings:

- Double negation ($\eta \neq \zeta$): $\neg\exists x[\mathsf{hum}'(x) \wedge \neg\exists y[\mathsf{hum}'(y) \wedge \mathsf{love}'(e,x,y)]]$
- Negative Concord ($\eta = \zeta$): $\neg\exists x[\mathsf{hum}'(x) \wedge \exists y[\mathsf{hum}'(y) \wedge \mathsf{love}'(e,x,y)]]$

General remarks:

- We exploit identities to derive semantic concord.
- Identities are the major analytic tool of HPSG.
- Analogous accounts are given for Polish negative concord (Richter and Sailer, 2001b), for multiple wh-questions in German (Richter and Sailer, 2001a), and for past tense concord in Afrikaans (Sailer, 2003b).

4.3 "Sublexical Scope"

(27) Eine Schraube fehlt.
a screw is missing

$\mathsf{be\text{-}missing}'(\hat{}\lambda P.\exists x[\mathsf{screw}'(x) \wedge \check{}P(x)])$

(28) Outline of the lexical entry of *fehlen* (*be missing*):

$$\begin{bmatrix}\text{PHON} & \langle \textit{fehlen} \rangle \\ \text{SYNS} & \begin{bmatrix}\text{LOC} & \begin{bmatrix}\text{CAT} & \begin{bmatrix}\text{HEAD} & \textit{verb} \\ \text{ARG-ST} & \left\langle \begin{bmatrix}\text{LOC} & \begin{bmatrix}\text{CAT} & \begin{bmatrix}\text{HEAD} & \textit{noun}\end{bmatrix} \\ \text{CONT} & \begin{bmatrix}\text{INDEX VAR} & x\end{bmatrix}\end{bmatrix}\end{bmatrix} \right\rangle \end{bmatrix} \\ \text{CONT} & \begin{bmatrix}\text{INDEX} & \begin{bmatrix}\text{VAR} & e\end{bmatrix} \\ \text{MAIN} & \mathsf{be\text{-}missing}'\end{bmatrix}\end{bmatrix}\end{bmatrix} \\ \text{LF} & \begin{bmatrix}\text{EX-CONT} & \gamma \\ \text{IN-CONT} & \check{}P(x) \\ \text{PARTS} & \langle \mathsf{be\text{-}missing}'(e, \hat{}\lambda P.\delta), \hat{}\lambda P.\delta, \check{}P(x), P(x) \rangle\end{bmatrix}\end{bmatrix}$$

and $\check{}P(x) \triangleleft \delta$

5 Conclusion

- The inclusion of STORE and QUANTS in *synsem* in Pollard and Sag (1994), Pollard and Yoo (1998) and de Swart and Sag (2002) is motivated technically.
- Techniques of semantic underspecification allow for a more modular architecture of semantics.
- This leads to a cleaner devision between local and non-local semantic phenomena,
- and thus to a more constrained theory of selection and linking.

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