Frank Richter:
Algorithmische Syntax

Grammar Principles

(1) HEAD FEATURE PRINCIPLE (p. 34 and 399)

$$\begin{bmatrix} phrase \\ \text{DTRS } headed\text{-}struc \end{bmatrix} \rightarrow \begin{bmatrix} \text{SYNSEM LOC CAT HEAD} & \boxed{1} \\ \text{DTRS HEAD-DTR SYNSEM LOC CAT HEAD} & \boxed{1} \end{bmatrix}$$

(2) SUBCATEGORIZATION PRINCIPLE (p. 34 and 399)

$$\begin{bmatrix} phrase \\ \text{DTRS } headed\text{-}struc \end{bmatrix} \rightarrow$$

$$\begin{bmatrix} phrase \\ \text{SYNSEM LOC CAT SUBCAT } \boxed{1} \\ \\ \text{DTRS} \begin{bmatrix} headed\text{-}struc \\ \text{HEAD-DTR} \begin{bmatrix} sign \\ \text{SYNSEM LOC CAT SUBCAT } \boxed{3} \end{bmatrix} \\ \text{COMP-DTRS } \boxed{2} \end{bmatrix} \end{bmatrix}$$

$\wedge$ `sign-ss-append`($\boxed{1}, \boxed{2}, \boxed{3}$)

In its present form the SUBCATEGORIZATION PRINCIPLE presupposes a relation symbol `sign-ss-append` in the signature. The principles of grammar comprise a principle which fixes the intended meaning of `sign-ss-append` in the relational abstract feature structures admitted by the grammar. The textbook on *Grammar Formalisms and Parsing* contains all necessary details.

(3) ID PRINCIPLE (pp. 399 and 402–403)

$\begin{bmatrix} \text{DTRS } headed\text{-}struc \end{bmatrix} \rightarrow$

(SCHEMA$_1$ $\vee$ SCHEMA$_2$ $\vee$ SCHEMA$_3$ $\vee$ SCHEMA$_4$ $\vee$ SCHEMA$_5$ $\vee$ SCHEMA$_6$)

The ID Schemata can be spelled out as follows:

HEAD-SUBJECT SCHEMA:

$$\text{SCHEMA}_1 = \begin{bmatrix} \text{SS LOC CAT} \begin{bmatrix} \text{HEAD} & [\text{INV } minus\,] \vee \neg verb \\ \text{SUBCAT } elist \end{bmatrix} \\ \\ \text{DTRS} \begin{bmatrix} head\text{-}comp\text{-}struc \\ \text{HEAD-DTR} \begin{bmatrix} phrase \\ \text{SS NONLOC TO-BIND SLASH } eset \end{bmatrix} \\ \text{COMP-DTRS REST } elist \end{bmatrix} \end{bmatrix}$$

HEAD-COMPLEMENT SCHEMA:

$$\text{SCHEMA}_2 = \begin{bmatrix} \text{SS LOC CAT} & \begin{bmatrix} \text{HEAD} & [\text{INV } minus\,] \lor \neg verb \\ \text{SUBCAT REST } elist \end{bmatrix} \\ \text{DTRS} & \begin{bmatrix} head\text{-}comp\text{-}struc \\ \text{HEAD-DTR } word \end{bmatrix} \end{bmatrix}$$

HEAD-SUBJECT-COMPLEMENT SCHEMA:

$$\text{SCHEMA}_3 = \begin{bmatrix} \text{SS LOC CAT} & \begin{bmatrix} \text{HEAD INV } plus \\ \text{SUBCAT} & elist \end{bmatrix} \\ \text{DTRS} & \begin{bmatrix} head\text{-}comp\text{-}struc \\ \text{HEAD-DTR } word \end{bmatrix} \end{bmatrix}$$

HEAD-MARKER SCHEMA:

$$\text{SCHEMA}_4 = \begin{bmatrix} \text{DTRS} & \begin{bmatrix} head\text{-}marker\text{-}struc \\ \text{HEAD-DTR SS NONLOC TO-BIND SLASH } eset \\ \text{MARKER-DTR SS LOC CAT HEAD } marker \end{bmatrix} \end{bmatrix}$$

HEAD-ADJUNCT SCHEMA:

$$\text{SCHEMA}_5 = \begin{bmatrix} \text{DTRS} & \begin{bmatrix} head\text{-}adjunct\text{-}struc \\ \text{HEAD-DTR SS } [1] \begin{bmatrix} synsem \\ \text{NONLOC TO-BIND SLASH } eset \end{bmatrix} \\ \text{ADJUNCT-DTR SS LOC CAT HEAD MOD } [1] \end{bmatrix} \end{bmatrix}$$

HEAD-FILLER SCHEMA:

$$\text{SCHEMA}_6 = \begin{bmatrix} \text{DTRS} & \begin{bmatrix} \text{FILLER-DTR SS LOC } [1] \\ \text{HEAD-DTR SS} \begin{bmatrix} \text{LOC CAT} & \begin{bmatrix} \text{HEAD VFORM } finite \\ \text{SUBCAT} & elist \end{bmatrix} \\ \text{NONLOCAL} & \begin{bmatrix} \text{INHER SLASH} & [2] \\ \text{TO-BIND SLASH } \{[1]\} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$
$$\land \texttt{member}([1],[2])$$

The HEAD-FILLER SCHEMA presupposes an appropriately defined `member` relation: The signature contains this relation symbol, and a MEMBER PRINCIPLE defines its meaning.
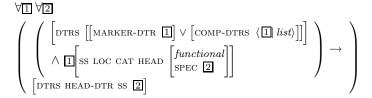
(4) INVERTED CONDITION for English (inferred from the text, p. 41)

$$\begin{bmatrix} verb \\ \text{INV } plus \end{bmatrix} \rightarrow \begin{bmatrix} \text{AUX} & plus \\ \text{VFORM } finite \end{bmatrix}$$
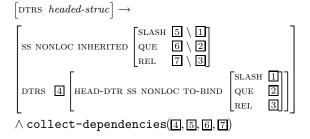
(5) MARKING PRINCIPLE (p. 45 and 400)

$$\begin{bmatrix} phrase \\ \text{DTRS } headed\text{-}struc \end{bmatrix} \rightarrow$$

$$\left(\begin{array}{c} \begin{bmatrix} \text{SS LOC CAT MARKING } [1] \\ \text{DTRS MARKER-DTR SS LOC CAT MARKING } [1] \end{bmatrix} \lor \\ \begin{bmatrix} \text{SS LOC CAT MARKING } [1] \\ \text{DTRS} \begin{bmatrix} \neg\ head\text{-}marker\text{-}struc \\ \text{HEAD-DTR SS LOC CAT MARKING } [1] \end{bmatrix} \end{bmatrix} \end{array} \right)$$

(6) SPEC PRINCIPLE (p. 51 and 400)

$\forall\boxed{1}\,\forall\boxed{2}$

$$\left(\left(\begin{bmatrix}\text{DTRS}\ \big[[\text{MARKER-DTR}\ \boxed{1}]\vee[\text{COMP-DTRS}\ \langle\boxed{1}\|\ list\rangle]\big]\end{bmatrix}\ \wedge\ \boxed{1}\begin{bmatrix}\text{SS LOC CAT HEAD}\begin{bmatrix}functional\\ \text{SPEC}\ \boxed{2}\end{bmatrix}\end{bmatrix}\right)\rightarrow\begin{bmatrix}\text{DTRS HEAD-DTR SS}\ \boxed{2}\end{bmatrix}\right)$$

(7) NONLOCAL FEATURE PRINCIPLE (p. 400)

$\begin{bmatrix}\text{DTRS}\ headed\text{-}struc\end{bmatrix}\rightarrow$

$$\begin{bmatrix}\text{SS NONLOC INHERITED}\begin{bmatrix}\text{SLASH}&\boxed{5}\setminus\boxed{1}\\ \text{QUE}&\boxed{6}\setminus\boxed{2}\\ \text{REL}&\boxed{7}\setminus\boxed{3}\end{bmatrix}\\[2em]\text{DTRS}\ \boxed{4}\begin{bmatrix}\text{HEAD-DTR SS NONLOC TO-BIND}\begin{bmatrix}\text{SLASH}&\boxed{1}\\ \text{QUE}&\boxed{2}\\ \text{REL}&\boxed{3}\end{bmatrix}\end{bmatrix}\end{bmatrix}$$

$\wedge\ \texttt{collect-dependencies}(\boxed{4},\boxed{5},\boxed{6},\boxed{7})$

In the formulation of the NONLOCAL FEATURE PRINCIPLE above, the relation `collect-dependencies` is responsible for providing the set union of the SLASH, QUE and REL values of the daugthers of the phrase. The set difference relation, here symbolized in infix notation as '$\setminus$', is needed to express the set difference between each of these sets and the corresponding TO-BIND values at the head daughter.

(8) WORD PRINCIPLE (not mentioned in Pollard and Sag's book)

$\begin{bmatrix}word\end{bmatrix}\rightarrow(\text{LE}_1\vee\ldots\vee\text{LE}_n)$

The disjuncts in the consequens of the WORD PRINCIPLE (8) are descriptions of words. Every LE_i is called a *lexical entry*. The set of lexical entries constitutes the *lexicon* of the grammar.

The authors of the HPSG book do not present a systematic list of the lexical entries that they assume for their grammar. Whenever they discuss lexical entries, they actually provide only a partial description of them which mentions those parts of the necessary complete lexical entry that are immediately relevant for the discussion in the surrounding text. In the end it is up to the reader to infer from the overall presentation of the grammar what the lexical entries look like. This is a very non-trivial task indeed, especially in light of the fact that HPSG is often regarded as a highly lexicalized grammar framework, which means that the words are complex structures whose exact properties are crucial for the proper specification of the syntax and semantics of utterances.

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