

Some Universal Principles and Grammar rules

We explain some of the universal principles proposed in HPSG and consider some phrasal constructions with HPSG grammar rules.

The **Head Feature Principle** (HFP) can be formulated as a constraint on phrases of the type hd-ph. This principle restricts the sharing of the HEAD feature between a mother sign and its head daughter as shown in (1). HEAD always takes as its value a feature structure appropriated to each category as discussed in the last section (see the values of the HEAD features of *drinks* and *milk* in Figure 6.6). The effect of the sharing restriction is to guarantee that headed phrases really are a *projection* of their head daughters. In Figure 6.6, the HD-DTR, *drinks*, of the hd-comp-ph, *drinks milk*, passes its HEAD feature's value to the HEAD feature of its mother (marked by the dotted ellipse). The HD-DTR, *drinks milk*, of the hd-subj-ph, *Leslie drinks milk*, passes its HEAD feature's value to the HEAD feature of its mother. HFP also indicates that the category of verb phrases are verb because they have verbal heads and that of noun phrases are nominal because they have noun heads. This principle is applied to all grammar rules.

$$(1) \quad \text{hd-ph} \Rightarrow \left[\begin{array}{l} \text{SYNSEM | LOC | CAT | HEAD} \quad [1] \\ \text{HD-DTR} \quad \quad \quad [\text{SYNSEM | LOC | CAT | HEAD}] \end{array} \right]$$

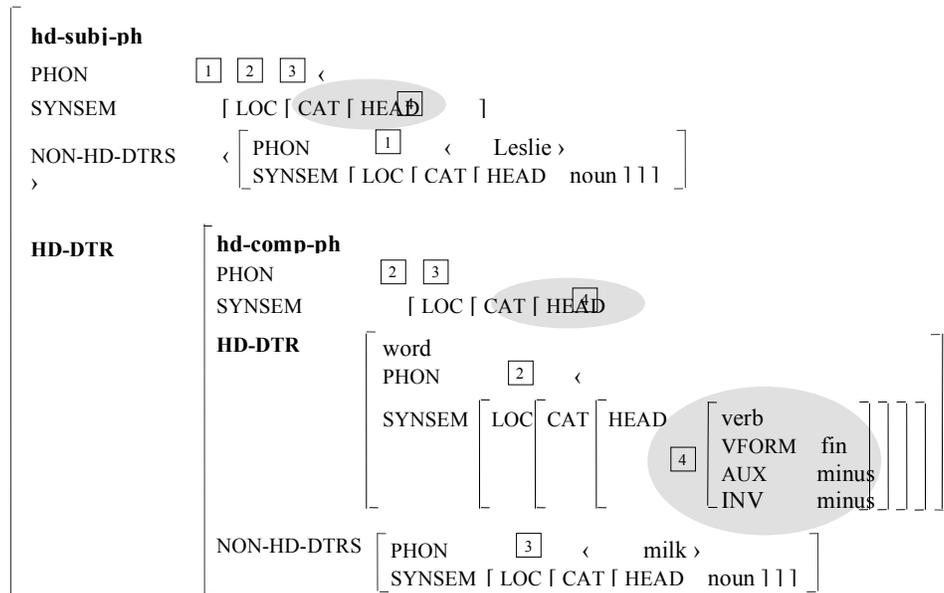


Figure 6.6: HFP applied to *Leslie drinks milk*

The *Semantics Principle* (second version) [Pollard and Sag 1994] guarantees that the semantics of a mother sign constrained by the feature CONT are identified with that of the adjunct daughter (ADJUNCT-DTR) if the phrase is the type of head-adjunct-phrase (hd-adjunct-ph). However, if the phrase is not the type of hd-adjunct-ph then the semantics of a mother sign are identified with that of the HD-DTR as in (2). The features CONT is concerned principally with linguistic information that bears directly on semantic interpretation. The CONT value of nominals (e.g., lexical nouns and their phrasal projections) is the feature structure of INDEX and restriction (RESTR).

$$(2) \quad \text{hd-ph} \Rightarrow \left[\begin{array}{l} \text{SYNSEM | LOC | CONT} \quad \boxed{1} \\ \text{HD-DTR} \quad \quad \quad [\text{SYNSEM | LOC | CONT} \boxed{1}] \end{array} \right]$$

with the exception of the hd-adjunct-ph

$$\text{hd-ph} \Rightarrow \left[\begin{array}{l} \text{SYNSEM | LOC | CONT} \quad \boxed{1} \\ \text{ADJUNCT-DTR} \quad \quad \quad [\text{SYNSEM | LOC | CONT} \boxed{1}] \end{array} \right]$$

The type INDEX is classified into three subtypes: *referential* (ref), *there* and *it* [Pollard and Sag 1994]. The types *there* and *it* are used only for the expletive pronouns *there* and *it* while the type *ref* are used for nouns. INDEX introduces the three agreement features: PERSON (PER), NUMBER (NUM) and GENDER (GEN). The INDEX values of *Leslie* and *milk* are shown in Figure 6.7. According to the AVM diagram representation illustrated in Figure 6.7, the linguistic meaning of *Leslie* is that the object is referred to as Leslie, its quantity is one and its gender is masculine. The PERSON feature is unspecified for *Leslie*. *Milk* is a 3rd person, singular and neutral. The INDEX feature⁴ plays an important role in HPSG account of binding theory. For example: the indices for John and himself, in the sentence *John shaved himself*, should be shared [Matheson 1996].

The value of the feature RESTR is a set of parametrized states-of-affairs (psoas). States-of-affairs (soa, the term used in situation semantics, it is what philosophers call propositions) are possible ways the world might be construed [Pollard and Sag 1987]. Psoa is like a soa except that certain of its argument roles (its parameter) have not yet been anchored to determinate objects. The idea behind the feature RESTR is that it contains the basic semantic information on a referent [Matheson 1996], e.g., the RESTR value of the lexical entry *milk* contains the basic semantic information that the object concerned is *milk*. In addition, the values of the INSTANCE and INDEX features are unified (the restriction imposed by the common noun is associated with the marker in the discourse as discussed in Footnote 3) [Matheson 1996].

⁴ The INDEX feature is used in the HPSG analysis of discourse structure. For example, in the sentences: “the man likes books. he often reads them”, the two markers representing *the man* and *books* in the first sentence should be identified with the markers for *he* and *them*, in the second sentence, respectively [Matheson 1996].

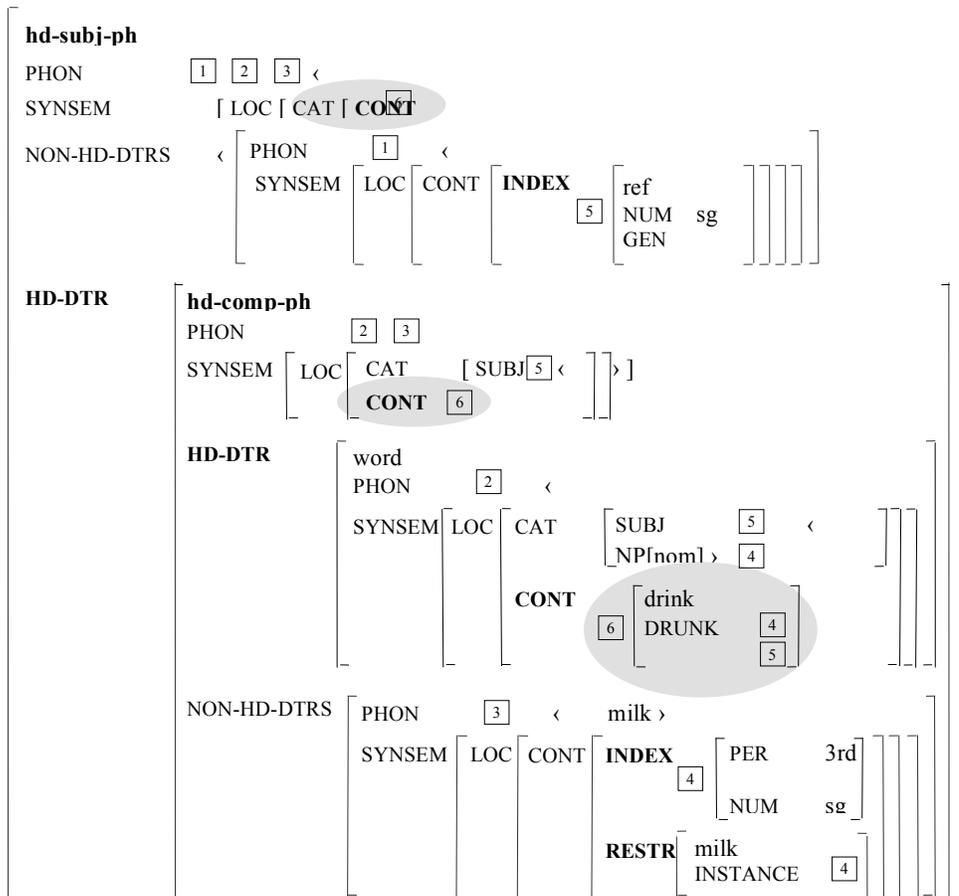


Figure 6.7: Semantic principle applied to *Leslie drinks milk*

The CONT value of verb is the feature structure of predication specified: what kind of relation is involved and who (or what) is participating in the relation. The CONT value of the lexical entry *drinks* is illustrated in Figure 6.7, it corresponds to the condition that ⁵ drinks ⁴.

The effect of the semantic principle is illustrated in Figure 6.7 (marked by the shaded ellipse). The CONT value of the *hd-comp-ph drinks milk* is passed from its HD-DTR *drinks* (indicated by the tag ⁶) and the CONT value of *drinks milk* is passed to that of *hd-subj-ph* (indicated by the tag ⁵) since *drinks milk* is the HD-DTR of *Leslie drinks milk*. The semantic representation in Figure 6.7 means *Leslie drinks milk* depicts a proposition which satisfies the conditions that ⁴ is a masculine referred to as Leslie, ³ is milk, and Leslie drinks ⁵ milk. This principle is applied to all ⁴ grammar rules. For more principles e.g., Spec Principle, Marking Principle, Nonlocal Feature Principle and Relative Uniqueness Principle, consult [Pollard and Sag 1987], [Pollard and Sag 1994], and [Matheson 1996].

The **Head_complement rule** allows a lexical head to combine with the zero or more complements that it selects to form a phrase of type `hd-comp-ph`. This kind of phrase is subject to the constraint as in (3). The `COMPLEMENTS (COMPS)` value of the head must match a sequence of `SYNSEM` values of `NON-HD-DTRS`. The `COMPS` value is a list of feature structures. The list specifies a sequence of categories corresponding to the complements that the word combines with. For example: a verb *likes* (Figure 6.8), a `HD-DTR`, combines with its (only one) complement *John* in a `hd-comp-ph`. This means that the `SYNSEM` value of the `NON-HD-DTRS` of the phrase *likes John* is identified with

$$(3) \quad \text{hd-comp-ph} \Rightarrow \left[\begin{array}{l} \text{HD-DTR} \left[\begin{array}{l} \text{word} \\ \text{SYNSEM} | \text{LOC} | \text{CAT} | \text{COMPS} \quad [1] \quad [2] \quad [n] \end{array} \right] \\ \text{NON-HD-DTRS} \quad \langle [\text{SYNSEM} [1] \quad 1, [\text{SYNSEM} [2] \quad 1, \dots, [\text{SYNSEM} [M] \quad 1] \rangle \rangle \end{array} \right]$$

$$\left[\begin{array}{l} \text{hd-comp-ph} \\ \text{PHON} \\ \text{SYNSEM} | \text{LOC} | \text{CAT} \quad \left[\begin{array}{l} \text{SUBJ} \quad [1] \\ \langle \quad \rangle \end{array} \right] \\ \text{HD-DTR} \quad \left[\begin{array}{l} \text{word} \\ \text{PHON} \quad \langle \text{like} \rangle \\ \text{SUBJ} \quad [1] \quad \text{NP} \rangle \\ \text{COMPS} \quad \langle [2] \text{NP} \rangle \end{array} \right] \\ \text{NON-HD-DTRS} \quad \left[\begin{array}{l} \text{PHON} \\ \text{John} \rangle \quad [2] \end{array} \right] \end{array} \right]$$

Figure 6.8: Head_complement rule applied to *likes John*

The **Specifier_head rule** (`spr_hd`) allows a lexical head to combine with its specifier that it selects to form a phrase of type `spr-hd-ph` as in (4). The `spr_hd` rule requires a two-way restriction: specifiers restrict their heads and heads restrict their specifiers [Matheson 1996]. For example, a specifier *this* selects singular nouns while common nouns select determiners as their specifiers. Therefore, the features `SPECIFIER`, `SPR` and `SPEC`, are introduced. `SPR` restricts the co-occurrence for heads and the specifiers they select. `SPEC` restricts the heads, the kinds of things they specify. A noun *book* (Figure 6.9), a `HD-DTR` of a `spr-hd-ph` *the book*, combines with its determiner *a*, `SPEC-DTR`, which instead selects singular nouns to be specified.

$$(4) \quad \text{spr hd ph} \Rightarrow \left[\begin{array}{l} \text{SPEC-DTR} \quad [1] \quad [\text{SYNSEM} | \text{LOC} | \text{CAT} | \text{HEAD} [S] \text{SPEC}] \\ \text{HD-DTR} \quad [2] \quad \left[\begin{array}{l} \text{phrase} \\ \text{SYNSEM} | \text{LOC} | \text{CAT} | \text{SPR} \quad [1] \end{array} \right] \end{array} \right]$$

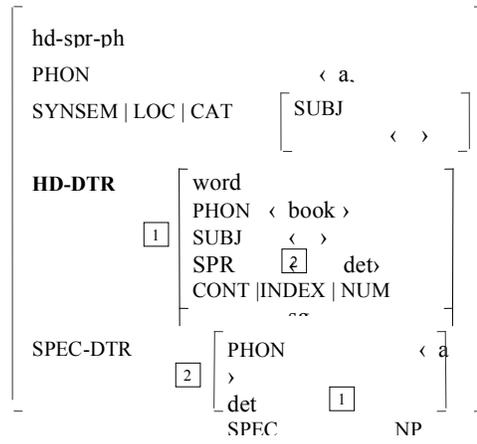


Figure 6.9: Specifier_head rule applied to *the book*