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Simpler Semantics in a Minimalist Construction Grammar

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Abstract

In line with Chomsky's Minimalist Program, unification grammars offer desirably simple solutions, particularly in construction grammar varieties that require a cognitively plausible semantics. With development in Sign-Based Construction Grammar, an unfortunate tendency towards unnecessary complexity may now be addressed. An overview of the relative advantages is presented with suggestions for applications to a variety of linguistic phenomena.

チョムキーの「Minimalist　Program」（最小主義プログラム）に沿って、単一化文法は望ましいシンプルな形で文法の問題を解決することができる。特に認知言語学的にもっともらしい意味論を要求する構文文法の分析分野ではなるべく分かりやすい説明が良い。サイン・ベース構造文法の発展により、不必要に複雑な方向へと向かう残念な傾向について指摘されるべきかもしれない。

Introduction

The need for simplicity is a recurring and enduring theme in linguistic theory. Culicover and Jackendoff (2005), for example, make a number of suggestions that agree with many of the assumptions made in non-mainstream, non-derivational theories like Head-Driven Phrase Structure Grammar (Pollard & Sag, 1994), Lexical-Functional Grammar, (Dalrymple, 2001) and in the emerging "cognitive" approaches (Boas & Sag, 2011; Fillmore & Kay, 1993; Goldberg, 1995) to linguistic inquiry. In seeking to simplify, one major and obvious advantage of unification-based approaches is that movement operations may be dispensed with altogether rather than merely reduced.

In mainstream approaches, of course, starting with the Minimalist Program (Chomsky, 1993), an attempt has been made to reduce the inventory of syntactic operations. Even though Koster (1986) developed a non-derivational Government and Binding model of syntax that rejected the notion of move α altogether, this has tended to involve reducing movement operations rather than disposing with them completely.

Interestingly, to take one example, although data related to feature-percolation and pied piping (Ross, 1967) poses enormous challenges for feature-movement accounts (Heck, 2009), it appears that non-derivational approaches have not impinged on the popular imagination, either as promising minimalist solutions or otherwise. Michaelis (2012) suggests that "the

constructivist correction of the 1990s" (Boas & Sag, 2012, page 32) has been all but ignored. She points out that cognitive frameworks such as Sign-Based Construction Grammar (SBCG) suffer from popular misconceptions that prevent them from being taken seriously. Michaelis's view is that this is because such theories are incorrectly perceived as being only applicable to minor idiomatic data.

Of course, there are other possibilities for this lack of interest in non-Chomskyan theory. For example, Kobele (2005) acknowledges that pied-piping is hugely problematic for a minimalist account involving movement yet does not explore unification-based alternatives. This is odd because, in unification-based accounts, feature-percolation is literally a form of feature-unification. Even so, complex feature structures can appear daunting. In this paper, I take up the case of SBCG and suggest that unification based cognitive accounts are perhaps ignored because they do indeed suffer from historically ingrained yet unnecessary over-complexity. In this regard, I show that the blending of Frame Semantics (Fillmore et al, 2003; Fillmore & Baker, 2010) and Minimal Recursion Semantics (MRS, see Copestake et al., 1999) offers clear opportunities to simplify semantics and move towards a minimalist construction grammar.

Failure to unify

There is reason to believe that unification-based theories of grammar are sometimes ironically guilty of failing to unify sufficiently. Focusing on Head-Driven Phrase Structure Grammar (HPSG), Evans (1996, 1998) argues that a simple formulation of conditions on feature inheritance has suffered from an unmotivated division of labor. The inventory of inherited features has historically included head features, *wh*-features, trace-like features, and quantifier features. Indeed, SBCG, a development of HPSG reconsidered from a cognitive perspective, disposes with dedicated quantifier features and inheritance conditions are generally uniform. I argue here that further simplification is possible.

I focus here on the matter of semantic features in SBCG and the way in which these are propagated up phrase structure trees. In general, the inheritance of semantic FRAMES from daughters to mothers should be understood as an amalgamation-based operation that allows a more cognitively plausible understanding of semantics.

Adjuncts and the disappearing semantic features

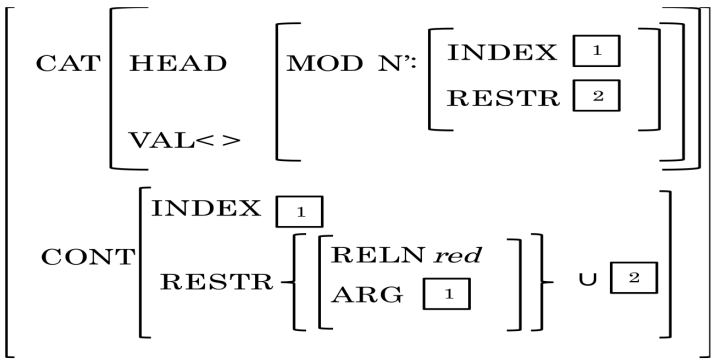
The problem of semantic features in HPSG can be traced historically to the matter of adjuncts. Consider, for example, the following:

(1)　I picked up the red book.

The object nominal in (1), *book* is clearly the head of the noun phrase (NP) *the red book*. The adjective *red* must be regarded as an adjunct of some kind. A more difficult question relates to how the semantic features of the NP may be determined. Pollard and Sag (1987) assumes that nominal heads select their adjuncts. Pollard and Sag (1994) assumes that, on the contrary, adjuncts select their nominal heads. Crucially, it was assumed that the CONTENT features of the NP are inherited through the head, irrespective of how the head is determined. The CONTENT features of a nominal like *book*, for example, consist of an INDEX and a RESTRICTION (RESTR). This RESTR naturally limits the index to instances of books. Below is a simple sketch of how the CONTENT features of an adjectival adjunct such as *red* are determined in classic HPSG.

In (2), the reader can see that an adjunct such as *red* has to make reference to the CONTENT features of a nominal it selects while actually carrying those features in its own CONTENT.

(2) Syntactic and semantic (SYNSEM) features of red in HPSG:



As can be seen from the HEAD features in (2), an adjunct like *red* selects a nominal N' with INDEX value 1 and RESTR value 2. Index numbers 1 and 2, of course, merely indicate structure sharing and are arbitrary. The curly brackets have no function other than to indicate a set and allow a mathematical union formula in RESTR. The INDEX of *red* is shared with the noun's INDEX while the adjective's own RESTR value is the union of the adjective's own unique RESTR and the modified noun's RESTR.

The obvious problem here is that the semantic features of a word like *red* actually carry the semantic features of the nominal. This is clearly counter-intuitive, to say the least, and is purely a product of the need to have the relevant features inherited through one head or another. A simpler and more natural alternative is to have the RESTR value of a phrase such as *red book* amalgamated from the daughters rather than carried by one daughter. In other words, the RESTR of *red* in (2) need make no reference to RESTR 2 and the curly brackets could be dispensed with. This is essentially the solution suggested (although not clearly stated, as far as I am aware) in SBCG.

When is a head not a head?

In SBCG, a construction grammar that seeks to provide a model of general cognition through language, a characterization of semantic content is of some importance. Cognitive linguists take words to be signs in the Saussurean (1916) sense, as an associative bond between a sound concept and a semantic concept. From a cognitive perspective, having words like *red* carrying the RESTR values of larger NPs is severely problematic.

Another problem is that, in order to make such an approach work, adjuncts must be identified as *semantic heads* contributing their CONTENT features in adjunct-head constructions. In other words, in an adjunct-head construction with N' head and adjunct daughters, the CONTENT value must be inherited from the adjunct or the semantic contribution of the adjunct will be lost. This is also highly counter-intuitive because adjuncts are clearly not heads, by definition. One could easily argue that this is damaging to a head-driven theory such as HPSG because a category is being identified as a head when, from both a cognitive and commonsense perspective, it is clearly nothing of the sort.

In fact, a simple solution to these problems is to have CONTENT features of phrases identified straightforwardly as CONTENT features of heads (in other words, in this case, the N') *except* that RESTR features will be the union of the RESTR values of the daughters. This basically means that core CONTENT is the INDEX value.

More complications with non-heads and semantics

The job of an adjective is to modify a nominal, so it is perhaps not entirely unnatural that its semantic features are identified with the modified category. One might, therefore, look at cases in which this semantic modification is highly implausible. For example, consider the case of so-called floating quantifiers (FQ).

Unlike languages such as Korean and Japanese, English only allows the quantifiers *all*, *each*, and *both* to "float." Thus, we get examples such as shown in (3) below (from Yoo, 2006):

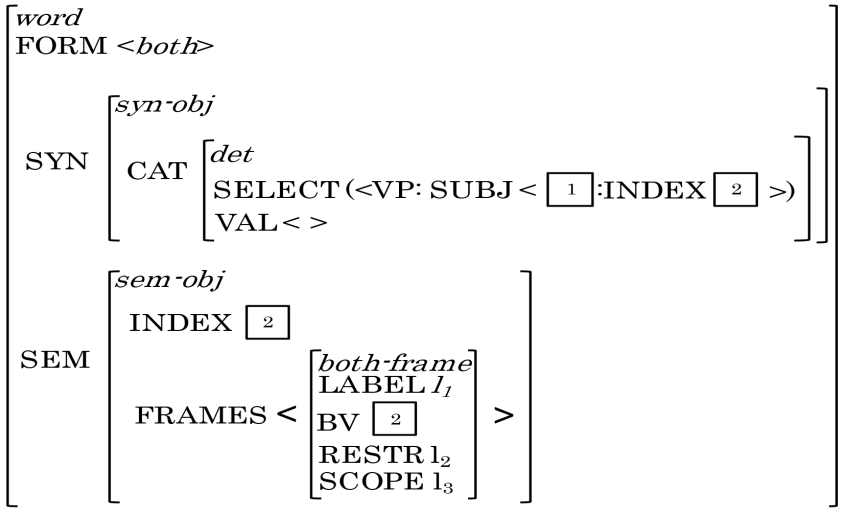
(3) a. The children have all read the books.
b. John's brothers have both read the book.

The relevant FQs are clearly adjoining to VP in (3) a and b. Under traditional HPSG approaches, if the adjunct is the semantic head in these cases, its CONTENT must also be verbal. Yoo (2006) offers such an account in which quantifiers are VP modifiers. Yoo's HPSG account allows us to dispense with movement operations (Maling, 1976; Sportiche, 1988; McCawley, 1998; Haegman & Gueron, 1999; Miyagawa, 2005) via an inheritance strategy.

This requires that the CONTENT of the quantifier be identified with the CONTENT of the VP *plus* the semantic contribution of the quantifier.

Alternatively, quantifier determiners optionally select VPs, making a semantic contribution to the VP's subject, but not carrying the CONTENT of the VP. This is straightforwardly possible if semantic features are amalgamated across daughters. In SBCG, HPSG's RESTR is replaced with the FRAMES feature (Fillmore, 1982, 1985; Fillmore & Baker, 2010).

(4) SBCG specifications for *both*:



Assume that the SEM value of a phrase is identical to the SEM value of the head daughter (essentially an index). The FRAMES value is the amalgamation of FRAMES from both daughters. This allows the contribution of the quantifier to the subject NP to be handled rather simply. Note that the quantifier's frame is linked to the INDEX of the VP subject via the BV (bound variable) attribute. The LABEL and SCOPE features in *both-fr* play a role in the determination of appropriate scope.

One could extend such an approach to handle FQs in Japanese if quantifiers are allowed to take their own INDEX and BV values from a wider (although still restricted) range of arguments, not just subjects as in English. (The following examples are from Fukushima (1991)).

(5) Gakusei-ga hon-o sensei-ni san-satsu okutta.
student-nom book-acc teacher-dat three (book-classifier) sent
A student sent three books to a teacher.

In (5), the quantifier-classifier *san-satsu* may select a VP and identify its BV with an appropriate object NP (presumably subjects and complements), with slightly different

SELECT features from (4).

(6) a. *Gakusei-ga hon-o sensei-ni san-nin okutta.
student-nom book-acc teacher-dat three (person-classifier) sent
(Intended reading:) A student sent a book to three teachers.

b. Hon-o gakusei-ga kinou san-nin katta.
book-acc student-nom yesterday three (person-classifier) bought
Three students bought a book yesterday.

c. *Hikouki-ga hikoujou-kara san-kasho tobitatta.
airplane-nom airport-from three (place-classifier) took off
(Intended reading:) Airplanes took off from three airports.

To account for the contrasts in 6, it appears that (parallel to the case in English) certain non-subject or non-complement elements may not readily allow the VP-adjoined bound variable linkage. While FQs in Japanese pose a complex problem and much work needs to be done, these facts are suggestive of straightforward explanations.

Relative Clauses

Sag (1997) points out that many languages, such as Korean and Bantu, have special morphology on the highest verb in relative clauses. Sag's examples are shown below:

(7) a. John-i chayk-ul ku sangca-ey neh-ess-ta.
John-nom book-acc ku box-loc put-past-decl
John put the book in the box.

b. [[John-i chayk-ul neh-un] sangca-ka] khu-ta.
John-nom book-acc put-rel box-nom big-decl
The box in which John put the book is big.

Sag speculates that these rel-inflected verbs select NPs via the HEAD¦MOD feature (this is treated via the SELECT feature in SBCG). Generalizing to English, Sag suggests that certain phrases, notably S [fin]: SUBJ< >, SLASH[1], may carry a HEAD¦MOD feature. The INDEX of the NP may then be linked to the INDEX of SLASH, or REL where this is non-empty.

Alqurashi and Borsley (2012) point out a severe problem relating to this treatment of relative clauses in HPSG. Most damagingly for Sag's analysis, following Ginzburg and Sag's (2000) Generalized Head Feature Principle (GHFP), the semantic content of a finite verb is required to vary depending on whether it selects a relative clause or not. This follows if

adjunct clauses are required to carry the CONT of the NPs that they modify, but not with FRAMES amalgamation. Sag (1997) introduces a special head-relative-phrase as an *ad hoc* means of overriding the GHFP and allowing the adjunct clause to retain its expected CONT value.

The need for an *ad hoc* solution could be taken as evidence that adjuncts do not actually carry the CONT of MOD values, and that an MRS-style FRAMES-amalgamation solution is correct. However, in order to explain data related to relative clauses in Standard Arabic, Alqurashi and Borsley (2012) resort instead to an empty complementizer that takes indefinite NP as its MOD value and S[fin] as its COMPS value. This empty complementizer then carries the appropriate CONT and allows the CONT of S[fin] to be propositional, as expected.

The problem, of course, is that Sag's original, rather compelling, evidence related to the morphology of verbs in relative clauses goes unexplained, while resort to an empty complementizer is actually no less *ad hoc* than the introduction of a special phrase type.

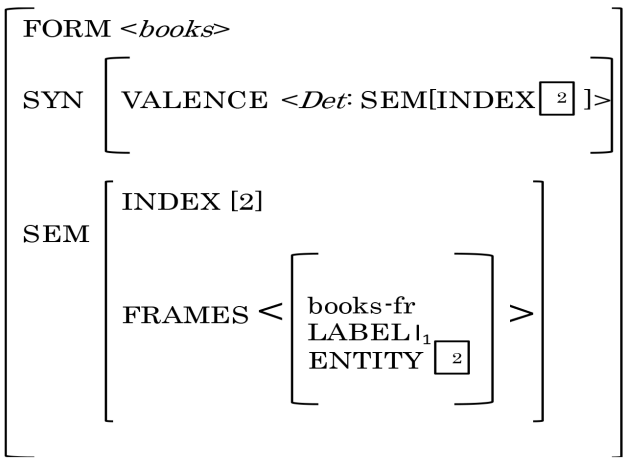
FRAMES update

In order to clarify the data presented so far, I offer a simple formalization regarding FRAMES amalgamation in SBCG. First of all, consider the conditions on headed phrases from Ginzburg and Sag (2000)

(8) SYNSEM/1
HEAD-DAUGHTER [SYNSEM/1]

This may be overridden by a simple FRAMES concatenation condition on headed phrases. Hence, just as VALENCY features are removed from a phrase's SYNSEM in appropriate headed phrases, FRAMES will be added.

In an NP such as *every book*, we may assume the following specifications for *books*:



(9)　SBCG specifications for *books*

According to (9) above, *books* takes a determiner that shares its INDEX with the INDEX of the noun itself, in this case presented as 2 in order to show how this might work with the specifications for *both* offered in (4).By structure sharing, this INDEX will also appear as the BV in the FRAMES of *both* in (4). In an NP such as *both books*, FRAMES from head and non-head daughters will be amalgamated.

Consider relative clause constructions such as (11):

(10)　I saw the man Mary likes.

We may assume in line with Sag (1997) that *Mary likes* (S[fin]: GAP <[1]: INDEX [2]>) may SELECT *man* (N': INDEX 2). As FRAMES are amalgamated from daughters, S[fin] will have the expected propositional SEM features. In line with (8), the complex N' *man Mary likes* will bear INDEX [2], the SEM features of the head N', while its FRAMES will be added to the FRAMES of S [fin].

In this manner, the generalization that relative clauses may select their nominal can be retained without any need to compromise the CONTENT of the clausal structure. Such an account applies naturally to Alqurashi & Borsley's (2012) account of relative clauses in Standard Arabic.

Conclusion

As a cognitive theory of grammar, SBCG requires a cognitively plausible treatment of semantics. This becomes a rather simple matter with the advent of FRAMES and MRS. From this follow a number of simplifications that suggest Minimalist solutions to explain facts that were previously highly problematic. It is to be hoped that SBCG can provide Minimalist coverage of a wide array of core phenomena.

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