

Non-Constituent Coordination and Semantics

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1. Introduction

This paper¹⁾ addresses some semantic problems in postulating a new analysis of Non-Constituent Coordination (NCC). By NCC, I mean examples generally analyzed in terms of such transformations as Gapping (1) and Conjunction Reduction (2).

(1) Marcia likes Ito, and Johnny TJ.

(2) Lou gave a dollar to Mark and a dime to Johnny.

The NCC constructions have led to much controversy concerning how they can be analyzed. There are at least three approaches suggested to account for the constructions under the framework of Head-driven Phrase Structure Grammar (HPSG): Kang (1996), B&S (1996), and Cho (1996). Even if each of them employs somewhat different mechanisms to explain NCC, it seems to me that they share the idea that the NCC generally believed to be a discontinuity construction can be analyzed as a continuity construction. This idea only works when the three analyses adopt a domain theory proposed either by Dowty (1992) or by Reape (1992) within HPSG. Specifically, they can provide a correct surface word order for each NCC in terms of the domain theory they chose. In syntax, each analysis seems to work for generating NCC, though they employ different tools to account for NCC. For example, Kang (1996) treats NCC as a filler-gap dependency phenomenon, so SLASH is a key mechanism. B&S (1996) suggest the concept of constituent sharing in accounting for NCC. Cho (1996) proposes a number of schemata (or sorts) licensing NCC structures. Both Kang (1996) and B&S (1996), however, are silent on the semantics of NCC.

Even though the analyses above may have various problems other than semantics, I limit myself to explore appropriate semantic interpretations for NCC sentences. To do so, I preview my account of semantics in language and then demonstrate how it can be expressed in a modified HPSG, after pointing out the problem of the semantic theory P&S (1994) assumed in explaining NCC.

1) The main part of this paper is excerpted from section 2.3.4 of Cho (1996).

Consequently, this paper will suggest why theories such as Kang (1996) and B&S (1996) face difficulties in suggesting appropriate semantic interpretations for NCC.

2. NCC and CONTENT

NCCs like *John kicks Mary and Kim Lee* as in (3) convey two propositions, namely 'John kicks Mary' and 'Kim kicks Lee'.

(3) John kicks Mary and Kim Lee.

To get (3) to have such reading, the basic strategy proposed here is to distribute the semantic content of the head daughter (e.g. the verb *kicks* in (3)) to each conjunct (e.g. *John Mary* and *Kim Lee*). In doing so, the semantic content of the head refers to semantic relation and fine-grained semantic roles while the semantic content of the NPs in each conjunct provides a value for a corresponding role assigned by the head. For example, if the semantic content of the head *kicks* in (3) is like (4) and is distributed to each conjunct, then, as shown in (5), the value for KICKER is assigned by the semantic content of the subject in each conjunct, *John* and *Kim*, while that for KICKED is given by the object in each conjunct, *Mary* and *Lee*.

(4) *kicks*:

RELATION	<i>kick</i>
KICKER	[]
KICKED	[]

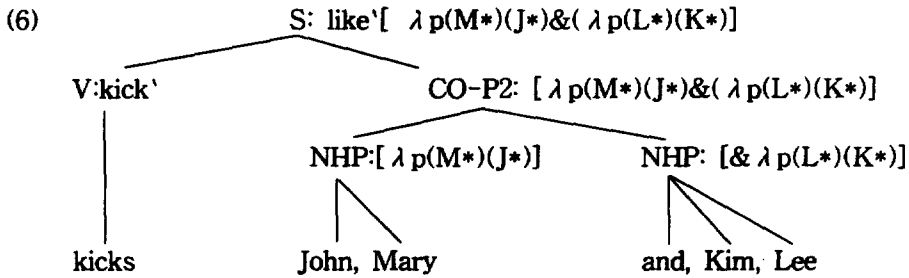
(5)

RELATION	<i>kick</i>
KICKER	John:[1]
KICKED	Mary:[2]

and

RELATION	<i>kick</i>
KICKER	Kim:[3]
KICKED	Lee:[4]

For readers familiar with Montague semantics, an adequate theory of the semantics proposed here would enable us to present (6) as a representation for (3). As can be seen in the semantic part of the top node in (6), the formula *kick*' [$\lambda(p(M^*)(J^*) \ \& \ (\lambda p(L^*)(K^*))$] is mapped into *kick*'(M^*)(J^*) & *kick*'(L^*)(K^*) by Lambda (λ)-conversion.



where *p* is a variable over two-place predicates.

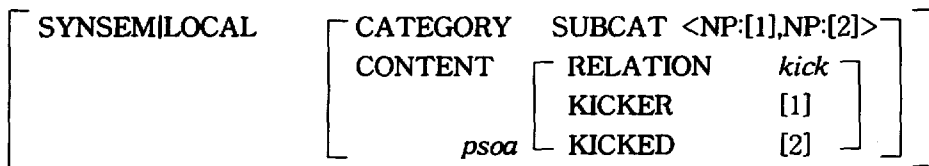
To accommodate this idea in P&S (1994), there are several incompatibility problems to solve even if the mother's meaning in a conjunct structure is assumed to be the union of the conjuncts' meaning as in (7).²⁾

(7) The Semantics Principle (for conjunction)

In a coordinate structure, the SYNSEM|LOCAL|CONTENT value is the union of the CONTENT values of the conjuncts.

The problem comes from the role assignment system of P&S (1994), in which all semantic roles are specified in the lexicon. The CONTENT attribute represents the semantic part of HPSG theory, and is based on situation semantics. Various *psaos* (parameterized states of affairs) are used to represent predicative meanings in HPSG. For example, the semantic content of the verb *kick* is encoded in the lexicon as shown in (8).

(8) *kick* :



where [1] and [2] stand for indexical values.

2) This principle requires my theory to treat the subsorts of content as sets, unlike current HPSG. In addition, coordinators such as *and* are regarded as operators, which scope over a set of content. The exact semantic nature of each coordinator, in fact, is beyond the scope of this paper.

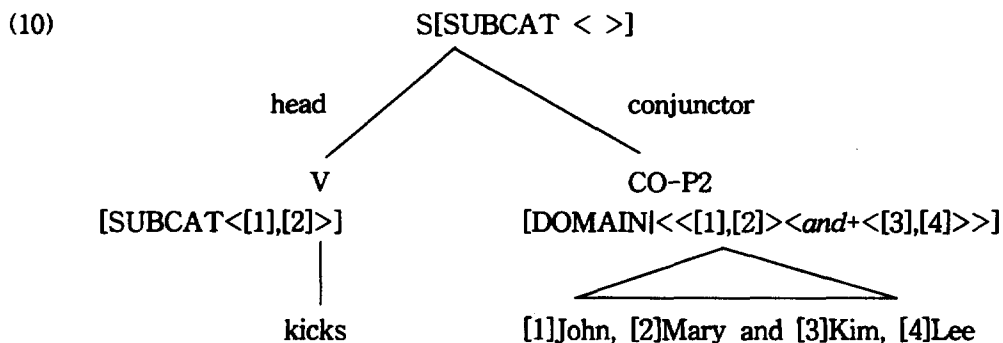
According to P&S (1994), the value for the semantic role KICKER is the index value of the subject (the first item on the SUBCAT list), whereas the value for KICKED is the index of the object (the second item on the list). The interpretation for the whole sentence *John kicks Mary* is the same as that for the semantic head *kicks*, by the definition of (9b).

(9) The Semantics Principle (P&S (1994; p 323))

(a) In a headed phrase, the RETRIEVED value is a list whose set of elements is disjoint from the QSTORE value set, and the union of those sets is the union of the QSTORE values of the daughters.³⁾

(b) If the semantic head's SYNSEM|LOCAL|CONTENT value is of sort *psoa*, then the SYNSEM|LOCAL|CONTENT|NUCLEUS value is token-identical with that of the semantic head, and the SYNSEM|LOCAL|CONTENT|QUANTS value is the concatenation of the RETRIEVED value and the semantic head's SYNSEM|LOCAL|CONTENT|QUANTS value; otherwise the RETRIEVED value is the empty list, and the SYNSEM|LOCAL|CONTENT value is token-identical with that of the semantic head.

This role assignment system, however, is not compatible to the idea that the semantic relation of the head and its fine-grained roles are distributed to each conjunct, in accounting for NCC like *John kicks Mary and Kim Lee*. As shown in (10), the revised version of the Subcategorization Principle⁴⁾ is satisfied, because the head daughter's (= *kicks*) SUBCAT list, namely <[1],[2]>, is the concatenation of the mother's SUBCAT list with the list consisting of the SYNSEM values of the phrases on the first list of the DOMAIN value of the conjunct daughter.



3) To simplify matters, this section will not deal with quantifiers such as *any*.

4) Refer to Cho (1996; p 44) for the exact definition of the revised Subcategorization Principle.

Consequently, the head's CONTENT value is predicted to be (11) under P&S (1994) and (9b) enforces the interpretation for the NCC to be equal to (11) since the semantic head is *kicks* in the head-conjunctor structure of (10).

(11) CONTENT $\left[\begin{array}{l} \text{RELN kick} \\ \text{KICKER [1]} \\ \text{KICKED [2]} \end{array} \right]$
qfsoa

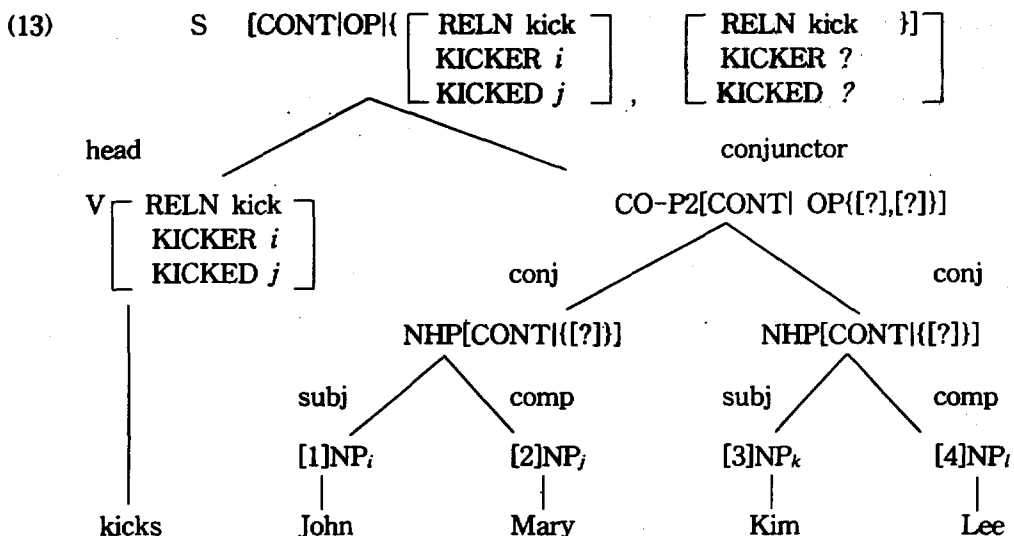
where [1] and [2] stand for the index of *John* and *Mary*, respectively and *qfsoa* means quantifier-free state of affair.

But the sentence *John kicks Mary and Kim Lee* conveys two propositions, namely 'John kicks Mary' and 'Kim kicks Lee', instead of the single proposition 'John kicks Mary'. This wrong prediction for the semantic part of NCC might be due to the Semantics Principle in (9b), rather than P&S (1994)'s semantic role assignment system. If so, (12) can be postulated for NCC, which expresses the idea of the distributivity of the head's semantic information to all conjuncts.

(12) The Semantics Principle (for NCC)

In a head-conjunctor phrase, the SYNSEM|LOCAL|CONTENT value is the set consisting of the unification of the head daughter's CONTENT value with each member of the conjunctor daughter's CONTENT value.

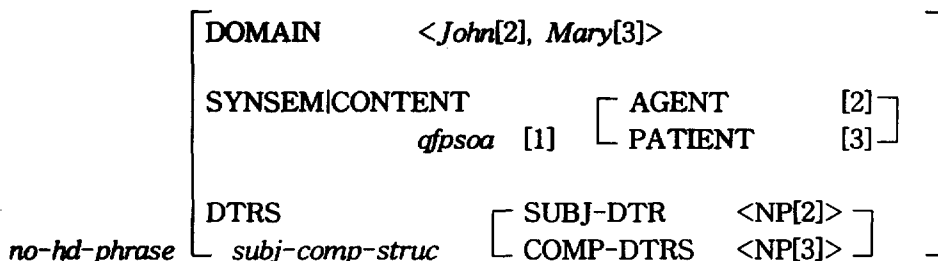
Under P&S (1994)'s role assignment system, this principle cannot provide correct interpretations for NCC, since the value for each semantic role is fixed in the lexicon. In other words, since KICKER and KICKED of *kicks* in (13) are already anchored to the indices of *John* and *Mary*, the unification of the head's CONTENT value with the second member of the conjunctor's CONTENT value will fail, if the nonheaded phrases' CONTENT values are assumed to have some indexical information. On the other hand, if the Non-Headed Phrases (NHP) do not bear any indexical information, (12) forces the NCC to have an interpretation like *John kicks Mary and John kicks Mary*. This is not what the NCC means.



I have shown how the idea of the distributivity to provide appropriate interpretations for NCC is not compatible with P&S (1994)'s analysis of semantic role assignment.

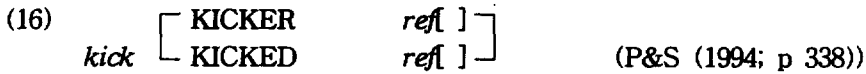
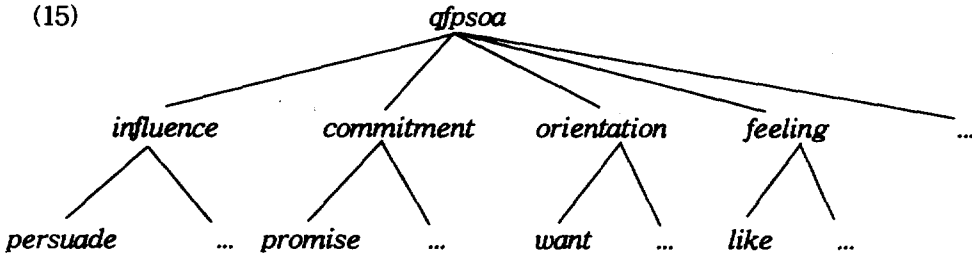
As an alternative, I provide a new analysis for the semantics of NCC, rejecting P&S (1994)'s semantic role assignment in the lexicon. This new semantic theory, first of all, assumes an independent grammar component which maps a grammatical relation to a fine-grained relation depending on a predicate (Cf. Grimshaw (1979), Jackendoff (1987)). Specifically, if there is a subject NP, then an AGENT role is assigned to the NP. Second, when the predicate for the subject is determined as *kick* in a given sentence, this theory assumes a way of classifying the KICKER, HITTER and READER roles as different realizations of a more general role called AGENT.⁵ Third, this theory regards the feature structure for nonheaded phrases as one in (14).

(14) NHP[NIL] :

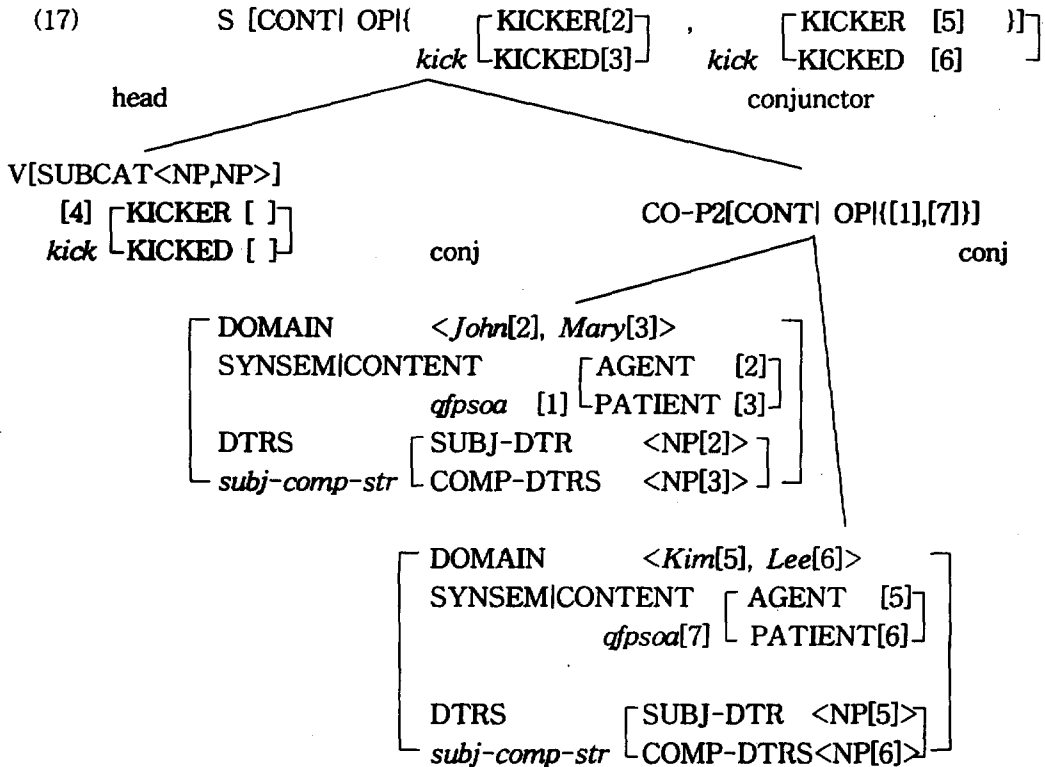


5) A similar method is already proposed by P&S (1994; p 342) to account for the semantics of nonpredicative prepositions.

Unlike the feature declaration of *qfpsoa* in P&S (1994), this theory regards the atomic sorts *kick*, *like* etc. as subsorts of the sort *qfpsoa*. Hence, the sorts for each relation (subsort of *qfpsoa*) can be represented as a sort hierarchy as in (15). Consequently, the predicate's CONTENT should be described like (16).



Given these assumptions above, my account can provide an appropriate interpretation for (3) as in (17), in conjunction with (12) and the revised Semantics Principle for coordination in (18).



(18) The Semantics Principle (for coordination)

In a coordinate structure, (i) the SYNSEM|LOCAL|CONTENT value is the union of the CONTENT values of the conjuncts

and (ii) if the CONTENT values of the conjuncts are a supersort, namely *qfpsoa*, their atomic sort must be shared.

Since the nonheaded phrases' CONTENT values, [1] and [7], are not atomic sorts such as *kick* or *persuade* but a supersort, *qfpsoa*, each member of the conjunctor daughter's CONTENT value in (17) must have the same atomic sort by the definition of (18). In the head-conjunctor structure of (17), the head daughter's CONTENT value, *kick*, which is an atomic sort, and each member of the conjunctor daughter's CONTENT value, [1] and [7], are unified as in (19) according to (12).

$$(19) \left\{ \begin{array}{l} [4] \left[\begin{array}{l} \text{KICKER []} \\ \text{kick} \left[\begin{array}{l} \text{KICKED []} \end{array} \right] \end{array} \right] \wedge \quad [1] \quad \left[\begin{array}{l} \text{AGENT [2]} \\ \text{PATIENT [3]} \end{array} \right] \\ \\ [4] \left[\begin{array}{l} \text{KICKER []} \\ \text{kick} \left[\begin{array}{l} \text{KICKED []} \end{array} \right] \end{array} \right] \wedge \quad [7] \quad \left[\begin{array}{l} \text{AGENT [5]} \\ \text{PATIENT [6]} \end{array} \right] \end{array} \right\}$$

where \wedge means 'is unified with'.

In order for this account to succeed, each supersort, *qfpsoa*, in (19) must be realized as an atomic sort, *kick*, by the sort compatibility I assumed here and similarly each general role like AGENT also must be realized as a fine-grained role like KICKER. Consequently, the result of such unification in (19) involves sufficient information to carry out the interpretation specified in the S node of (17). This account still needs to answer a lot of questions about how the newly postulated Semantics Principle can be reformulated to avoid any conflict with the existing Semantics Principle or how the concept of sort compatibility can be couched in current HPSG.⁶⁾ The problems related to such questions remain for further study.

However, there might seem to be problems with the idea of the distributivity of the head semantic sort.⁷⁾ In NCC examples where negation and the auxiliary

6) Georgia Green points out that if such a supersort is accepted in P&S (1994), the control theory will be problematic. (in personal communication).

verb are a head daughter, the negation acts as if it has scope over both conjuncts, but does not distributively negate each conjunct. Hence, the NCC in (20) can be construed not as in (21b) but as in (21a).

(20) Johnny didn't play bingo and Mary sit at home all morning.

- (21) a. It is not the case that Johnny played bingo and Mary sat at home all morning.
- b. Johnny didn't play bingo and Mary didn't sit at home all morning.

Oehrle (1987)

Since the head daughter in the head-conjunct structure is *didn't* in (20), an analysis on the basis of a simple distributive mechanism may accept (21b), if it is distributed to each conjunct. However, the analysis presented above escapes such difficulties in two ways. First, negation is not an atomic sort of qfpsoas, so it cannot be unified with any conjuncts according to the definition of the Semantics Principle in (18). Furthermore, negation is described as a value for the attribute POLARITY in situation semantics, though P&S (1994) neglect the attribute. To be more specific, according to Cooper (1990; chapter 7), infons (psoas) in situation semantics can be described as in (22).

(22) INFON [ISSUE [SEER [1]]]
 see [SEEN [2]]]
 [POLARITY +]

In (22), the distributive mechanism in general works for the ISSUE value under the analysis presented above, but the attribute POLARITY is different. Thus, negation is not distributed under this analysis.

7) James Yoon raised this question to me. In addition to the distributivity of negation in NCC, he also provides examples related to the distributivity of modals in NCC like (A).

- (A) Someone must eat natto and others drink milk.
- = It is necessary that someone eats natto and others drink milk.
- ≠/= Someone must eat natto and others must drink milk.

It is not clear how modals should be dealt with. But I believe that the explanation for negation in NCC might be applied to this modal problem.

3. Conclusion

This paper suggests a unification-based semantics to provide an appropriate interpretation for NCC constructions. Specifically, how the distributive mechanism works for the semantic CONTENT of NCC sentences in a slightly modified HPSG framework was focused on. On the other hand, it is unclear how the analyses such as Kang (1996) and B&S (1996) can provide an appropriate interpretation for NCC to be an adequate theory.

Even though this analysis for the semantic part of NCC presented above is far from exhaustive, I, however, expect that it can be extended to the full range of NCC semantic problems.

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