

Non-ATB Phenomena in GPSG

Yong-Bum Kim

1. Introduction

Coordination is one of the most frequent syntactic phenomena found in natural languages and yet it has remained one of the least explored areas in linguistics. Although there are many problems unsolved in English and Korean coordinate structures, this paper will merely touch on a couple of issues on coordination, especially the cases where gaps and wh-words are involved, and will suggest possible solutions to those problems. This paper will assume a monostratal approach to coordination taken by Gazdar, Klein, Pullum and Sag (1985, GKPS, hereafter) and by Sag, Gazdar, Wasow and Weisler (1985) which does not allow any type of deletion or reduction. This approach sharply contrasts with William's (1978) which provides a Conjunction Reduction analysis based on Chomsky's (1957) and Ross' (1967) idea on coordination.

2. Head Daughter Approach

GKPS and Sag et. al. (1985) view coordinate structures as multi-headed structures dominated by a single mother, and a very limited number of rule schemata as shown in (1) are postulated for a variety of coordinate structures in English:¹⁾

- (1) a. Iterating Coordination Schemata
 $X \rightarrow H[\text{CONJ } a], H[\text{CONJ } b]^+$
- b. Binary Coordination Schema
 $X \rightarrow H[\text{CONJ } a], H[\text{CONJ } b]$

Since heads are involved in these schemata, the Head Feature Convention

1) This approach is also taken up by Steedman(1985, 1987) who deals with English and Dutch coordinate constructions within a framework of categorial grammar.

(HFC, henceforth) must be crucially be satisfied in the structures licensed by these schemata. The HFC as formulated in GKPS imposes certain conditions on the similarity between the mother and the head daughters in a local tree and it can be translated as shown in (2):

(2) Head Feature Convention

- (i) The Head feature specifications on each head are extension of the Head feature specification of the category created by taking the intersection of the mother and the head daughters with the free feature specifications of the head.
- (ii) The HEAD feature specifications on the mother are an extension of the HEAD features of the category created by taking the intersection of the heads with the free feature specifications of the head. (Sag et al. 1985: 118)

Roughly speaking, this convention is a roundabout way of saying that the HEAD feature specifications of the mother and the daughter must be as much identical to each other as possible. This formulation of the HFC admits the sentences in (3) which contains non-identical conjuncts:

- (3) a. Pat is a Republican and proud of it.
- b. Pat is healthy and of sound mind.
- c. Pat is either stupid or a liar.
- d. That was a rude remark and in very bad taste.
- e. I am hoping to get an invitation and optimistic about my chances.

(Sag et al. 1985: 117-8)

Furthermore, as argued in GKPS and elsewhere, the across-the-board (ATB, hereafter) phenomena are easily handled by the Head Feature Convention which is motivated elsewhere in the grammar. So the sentences in (4) and (5) are elegantly accounted for without any further stipulation:

- (4) a. The doctor who Kim worked for and Sandy relied on died.
- b.*The doctor who Kim worked for and Sandy relied on Lee died.

- c. I know a man who Bill saw and Mary liked.
 d.*I know a man who Bill saw and Mary liked. (GKPS, 177)

- (5) a.*I am hungry and did you play chess?
 b.*Sally is sick and what did you bring me?
 c. When did you get back and what did you bring me?
 d. Did Mery show up and did you play chess? (Ross 1986: 114-5)

Let me elaborate a little bit about these sentences. (4a) involves coordination of two S/NP as shown in (6a) where SLASH is a HEAD feature which must appear on each conjunct if the mother has it. (4b) may be analysed as containing S/NP and S as shown in (6b). In this case, because SLASH is a FOOT feature as well as a HEAD feature, the mother must contain SLASH. Then the HFC requires that each conjunct must contain the SLASH feature. Thus, the across-the-board extraction is accounted for by postulating SLASH as FOOT feature as well as HEAD feature.



Now, if we turn to the across-the-board extraction in Korean there arises a problem with this approach because the SLASH feature in Korean does not seem to be a HEAD feature and because the Korean language manifests the ATB phenomena. Although I would not argue but simply assume that SLASH in Korean is not a HEAD feature, I might as well provide a couple of pieces of evidence for my position. Let us consider (7):

- (7) a. Motu-ka Mary-uy elkwul-i yepputa-ko sayngkakhanta.
 all-Nom M.-GEN face-NOM is-pretty-COMP think
 'Everyone thinks that Mary's face is pretty'
 b. Mary-nun motu-ka elkwul-i yepputa-ko sayngkakhanta.
 M.-TOP all-NOM is-pretty-COMP think

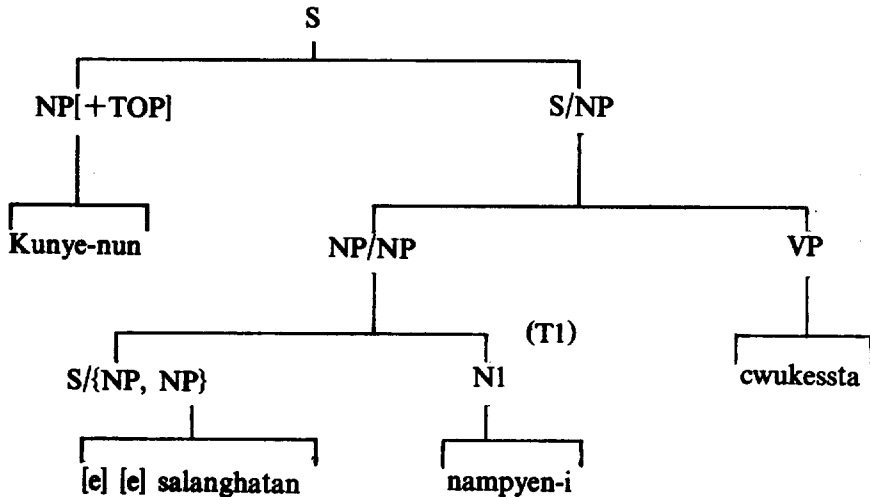
'As for Mary everyone thinks that (her)face is pretty'

In (7), Mary is displaced from the adnominal position of the embedded subject without being parasitic on any other gap. Thus, if SLASH were a HEAD Feature, (7b) should be ruled out by the HEAD feature Convention. If we turn to (8) we find another case which support our assumption.

(8) a. Kunye-ka salangha-ten nampyen-i cwukessta.
 she-NOM loved-REL husband-NOM died
 The husband that she loved died.

b. Kunye-NUN--salanghate-n nampyen-i cwukessta.
 she-TOP loved-REL husband-NOM died
 'As for her, (her) husband that (she) love died'

c.



As is well known, (8b) is analyzed as shown in (8c) and the topicalized phrase is considered to be displaced from the matrix S as we can see. This configuration would violate the HFC if SLASH were a HEAD feature in Korean, since SLASH feature should appear on NI as well in the local tree T1. Now, if we turn back to the ATB problem, we can see that the current approach to the ATB phenomena in GPSG, namely simply applying the HFC to the coordinate structure may not be comprehensive enough. Let us consider (9).

- (9) a. Jon-i Mary-lul salangha-ko Sue-lul silhehanta.
 J.-NOM M.-ACC love-CONJ S.-ACC hate
 'John loves Mary and hates sue.'
- b. *Sue-lul John-i Mary-lul salangha-ko __ silhehanta.
 S.-ACC J.-NOM M.-ACC love-CONJ hate
- c. ?? Mary-nun John-i - salangha-ko Sue-lul silhehanta.

(9a) has an unmarked word order and it may be seen as containing two VP's in coordination. (9b) and (9c) show that any type of displacement is not good if it is form one conjunct only. If we turn to (10), we find another case of ATB phenomenon, which involve relative clauses.

- (10) a. Mary-ka John-ul cohaha-ko na-eykey ku-lul sokayhayssta.
 M.-NOM J.-ACC like-CONJ me-DAT he-ACC introduced
 'Mary likes John and introduced him to me'
- b. Mary-ka __ cohaha-ko na-eykey __ sokayhayssten-n namca
 M.-NOM like-CONJ me-DAT introduced-REL man
 '(the man whom Mary liked and introduced to me'
- c. *Mary-ka __ cohaha-ko nay-eykey __ sokayhan namca
- d. *Mary-ka John-ul cohaha-ko nay-eykey __ sokayhan namca

Now, one of the most serious problems with the paradigms given in (9) and (10) is that not only grammatical sentences but ungrammatical sentences would be generated by the grammar if the SLASH feature is not a HEAD feature in Korean. The data seem to show that the Korean SLASH feature should appear on all the heads in the coordinate structure just as HEAD features do. In other words, although SLASH is a FOOT in the coordinate structure it behaves like Head features.

3. Coordination Head Approach

There seems to be at least two places in the grammar that we can look into in order to make the grammar instantiate the FOOT feature on each head in the coordinate structure. One is to examine the possibility of revising the FOOT Feature Principle since SLASH is a FOOT Feature. The other is to revise the

coordination schemata so that each conjunct contains the same specifications with respect to related features. The first option does not look promising for various reasons. Instead of discussing difficulties of the first option, we will choose to revise the coordination schemata. One of the strongest forms of coordination schema would look like the one shown in (11) where X is a variable over categories.

- (11) $X \rightarrow X[\text{CONJ } a], X[\text{CONJ } b]$
 where X is a variable over categories.

Since X is a variable instead of an underspecified category, the three categories in the schema must contain the same featural content except for CONJ. This revision would rule out ungrammatical sentences in (9) and (10) as we want. However, this schema seem to impose so strong a constraint that each conjunct may not differ from the other in any feature specification other than CONJ. Therefore, the data in (3) which have been taken care of by the original schema now become problematic, since these examples contain non-identical conjuncts. What seems to be the case is that the schema in (11) is too strong whereas the original one in (1) is not comprehensive enough. Is there any possibility of combining the two schemata so that the resulting schema can be flexible like the original one and strict enough like the one in (11)? In order to achieve this effect I revise the coordination schema based on the following idea: when coordination is involved the head becomes the special type of head which I will call coordination HEAD and this head is related to the features relevant to coordination. So it is suggested that the schema in (11) should be revised as in (12):

- (12) $X \rightarrow Hc [\text{CONJ } a], Hc [\text{CONJ } b]$

In this schema Hc represents coordination head in the same way as H denotes heads in an ID rule in GKPS. In addition, just as HEAD features are stored on the position represented by H, those features essential to coordination are instantiated on the coordination head according to the principle which would be very much identical to the HEAD Feature Convention. This can be done if we postulate a new species of features and introduce a principle or convention which will govern the distribution of those features. Thus, Coordination HEAD fea-

tures for Korean grammar would contain SLASH among others. This is shown in (13).

(13) a. Coordination Head Features: {SLASH...}

b. Coordination Head Feature Constraint (CHFC)

Let Φ_r be a set of projections from r which meets the FFP, the CAP and the HFC, where $r = \langle \langle \langle C_o, \{C_i, \dots, C_n\}_m \rangle, W_H \rangle, W_{HC} \rangle$

Then $\phi \in \Phi$ meets the CHFC on r if and only if

for all $C_i \in W_{HC}$, for any $\phi \in \Phi$ and for all COHEAD $\in H_c$, (where W_H and W_{HC} are multiset variables)

i) $((\phi(C_o)) \cap (\phi'(C_i))) \mid$ COHEAD is extended by $\phi(C_i) \mid$ COHEAD, and

ii) $((\phi(C_i)) \cap (\phi'(C_o))) \mid$ COHEAD is extended by $\phi(C_o) \mid$ COHEAD

The members of the Coordination Head Feature set are yet to be determined. If we translate the first clause of the Coordinate Head Feature Constraint, it would be as followed: if mother has certain coordination head feature specifications and if those feature specifications can possibly be instantiated on the coordination head, they should appear in the coordination head. In the same way, clause (ii) is intended to say that if a coordination head has certain coordination head feature specifications and if those specifications can possibly appear on the mother, then they should be present in the mother. I should admit that this type of solution is a bit stipulative since the Coordination HEAD Feature Constraint applies to coordinate structures only. However, this approach seems to resolve other problems in coordination which involves wh-words in English. Let us consider (14). and (15):

(14) a. *The boy who and the girl embraced is my neighbor. (Ross)

b. *I bought a book whose front cover is soft and its end cover is hard.

c. These reports, the wording on the covers of which has caused so much controversy are to be destroyed. (GKPS)

(15) a. *Who does Tom like - and Larry hates primates? (Goodal)

b. *Who gave what to whom and I am sickened at this sentiment.

Although this move complicates grammar a little because this notation is motivated only by the revised coordination schemata, this approach seems to take care of some other cases. Consider (18):

- (18) a. Na-nun chayk-ul ilk-ko pap-ul mekessta.
 I-TOP book-ACC read-CONJ meal-ACC eat-past.
 'I read a book and had a meal'
- a'. Na-nun pap-ul chayk-ul ilk-ko __ mekessta.
 (Cho and Morgan)
- b. Na-nun Mary-lul cohaha-ko Sue-lul silhehanta.
 I-TOP M.-ACC like-CONJ S.-ACC hate
 'I like Mary and hate Sue'
- b'. *Na-nun Sue-lul Mary-lul cohaha-ko __ silhehanta.

If we compare the first two sentences with the last two in (18), our previous observation that ATB phenomena appear in the case of 'extraction' seems to be questionable. (18a') has a gap in the right hand side conjunct only whereas (18b') would not allow such gaps. How can we handle the difference between the first pair and the second in this paradigm. What I consider to be crucial here is that (18a) has two interpretations as roughly shown in (19):

- (19)a. I read a book and then had a meal.
 b. I read a book at some point in the past and had a meal at some other point (probably at the same point) in the past.

Although (19a) would be an unmarked reading, it is possible to have the second reading and to find a context for such a reading. What is more interesting is the interpretation (19b) does not allow the word order variation shown in (18a'). Therefore (18a') has only one reading which is (19a) whereas (18a) has the two readings. As far as I know, English has a construction similar to (18a') and it is shown in (20):

- (20) a. Here is the whisky which I went to the store and bought __.
 b. Which granny does Aunt Hattie want me to be nice and kiss __.

(Ross 1986: 133-35)

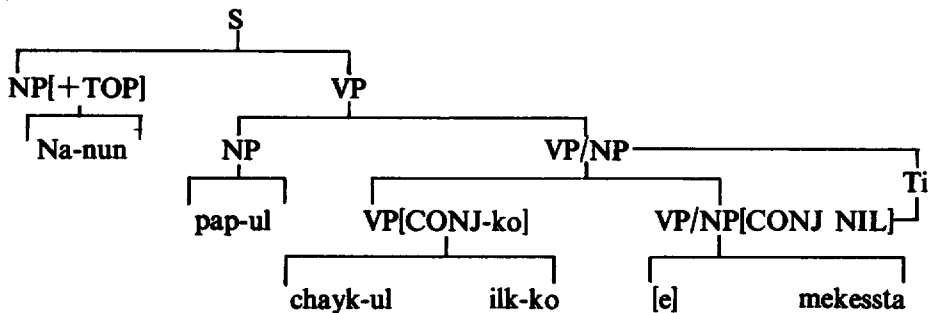
Now, what can we do with the examples in (18)? We should be able to generate sentences like (18a') on the one hand and rule out (18b') on the other. What I can suggest to solve the problem is to formulate a schema for (18a) or (18a') as shown in (21):

(21) $X \rightarrow H[\text{CONJ } a], H_c[\text{CONJ } b]$

That is, one constituent is simply a head; the other is a conjunction head. The schema shown in (21) can license (18b') and the schema itself suggests that this is kind of quasi-coordinate structure. And (18a') is roughly illustrated in (22) below. In the local tree TI below, the conjunct of the right hand side is a coordination head whereas the left daughter is simply a head. So the Coordination Head Feature Constraint only applies to the one on the right. However the left conjunct which is not a coordination head is not subject to this constraint.

As for the English examples in (20), we may be able to account for them provided that the SLASH feature in English is not a HEAD feature, either. If we follow Jacobson (1987) who insists that SLASH is not HEAD feature but merely a FOOT feature, then we can apply the rule in (21) to the English sentences without any further complication of grammar. This naturally presupposes that SLASH is one of coordination head features in English as well.

(22)



Furthermore, we can go one step further with this structure. Namely, we can freely instantiate SLASH on the left conjunct as well since the category is not a coordination head. In other words, our analysis does not prohibit a simultaneous extract of categories from the quasi-coordinate structure since the structure would satisfy the HFC and the Coordination Feature Constraint any way and this is

borne out by the examples in (23):

- (23) a. Mary-ka _ ilk-ko John-eykey _ Kwenha-n chayk
 M.-NOM read-CONJ DAT suggested-REL, book
 'The book which Mary read and suggested to John'
- b. Mary-ka ku uihak nonmun-ul ilk-ko John-eykey _ kwenha-n
 M.-NOM the medical article-ACC read-CONJ DAT suggested-REL
 chilyobep
 treatment
 *'(the)treatment which Mary read the medical article and
 suggested to John'
- c. ?Mary-ka ilk-ko John-eykey chilyobep-ul kwenha-n uihak nonmun
 M.-NOM read-CON J.-DAT treatment-ACC suggest-REL medical
 article
 *'(the)medical article which Mary read and suggested the treatment to
 John.'

(23a) has a gap in each conjunct as we have predicted: (23b) has a gap in the second conjunct only just as any other quasi-coordinate structure would do: (23c) in contrast has a gap in the first conjunct only and it sounds a bit unnatural and it violates the CHFC. In conclusion, it is suggested that coordination may involve a special type of multiple heads which may be called coordination head. It is also posited that the features relevant to coordination heads may well be designated as a separate feature set which is governed by a separate feature instantiation principle. This approach seems to enable us to account for some subset of coordinate structures where non-HEAD features behave like HEAD features.

4. Conclusions

This paper has proposed that our grammar should establish a separate set of features, which I will call Coordination Head features, and a principle which will govern the distribution of the features in question. This provision can account for some deviating cases involving gaps and wh-words in English and Korean coordinate structures, which have been problematic in GPSG and still more in

other syntactic approaches. This approach seems to shed light further on the constructions which look like coordinate structures but which is not purely a coordinate structures but structures involving sequential events.

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