

# The Feature-based Analysis of Constraints on Coordination in English: A GPSG Account\*

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## 1. Introduction

The GPSG account of coordination turned out to be fruitful in describing the constraints on coordination in English. However, so far, what has not been done clearly in GPSG literature is to formulate a generalized form of well-formedness condition on coordination. The paper concerns how to formulate this condition on coordination in English by the feature-based analysis in GPSG framework.

To achieve this goal, some relevant questions will be reviewed; that is, What features in GPSG are included in defining the categorial identity of conjoinable conjuncts? And does the distinction between HEAD and FOOT feature in GPSG have any relation to this account? Based on these observations, a generalized form of well-formedness condition on coordination in English will be proposed in the closing section of the paper.

It will be argued that each conjunct category should share some set of defining features for categorial identity between each other to ensure the acceptability of the coordinate structure. The defining features for categorial identity will be some particular HEAD features relevant to a specific ID rule required in a given context; while, as far as FOOT features are concerned, it will be argued that there is an absolute boundary where some FOOT features (i.e., two FOOT features, [SLASH] and [WH]) will be

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always included as the defining features for categorial identity.

Before we start our main discussion, let us be clear about what scope of coordination data we are going to deal with. Since coordination is not purely syntactic, but also affected by semantics and even by pragmatics, it is almost impossible to analyze the huge iceberg of coordination data all together. In this paper, I will concentrate myself on syntactic constraints on coordination or at least those which can be accounted for by the feature-based analysis in GPSG.

## 2. Categorial Identity and Coordination

In many cases of coordination, categorial identity seems to be a factor governing acceptability. Consider the following coordination constructions in (1).

- (1) (a) John wrote[to Lee] and [to Kim]. [PP and PP]  
 (b) John wrote [a letter] and [a postcard]. [NP and NP]  
 (c) \*John wrote [a letter] and [to Kim]. [NP and PP]  
 (d) \*John wrote [to Kim] and [a letter]. [PP and NP]

The examples in(1) show that two NPs or PPs are acceptably conjoined, but NP conjoined with PP or vice versa is unacceptable. With regard to this sort of constraint on coordination, the traditional grammar has roughly captured that only 'like (or identical) categories' can be conjoined idiomatically. However, this traditional account turned out to be too weak to account for some apparent counter examples. There exist so-called 'unlike categories' which still can be conjoined by *and* in English. For example, a variety of different phrase types can be coordinated when they are used predicatively; that is, as complement of a verb like 'be'. Consider the examples in(2).

- (2) (a) John is [a banker] and [extremely rich]. [NP and AP]  
 (b) John is [moody] and [under the weather]. [AP and PP]  
 (c) John is [a superb athlete] and [in a class of his own].  
 [NP and PP]

(Radford(1988))

Notice in(2)(a) that two different types of category, NP[a banker] and

AP[extremely rich], are conjoined by *and*, but the resultant coordination is still acceptable. The same story holds in(2)(b) and (2)(c). This shows that the categorial identity between two conjuncts in absolute sense; that is, as the same type of category NP or PP, is not a necessary condition on coordination. Then the question arises here as to whether categorial identity is a sufficient condition to ensure the acceptability of coordination. To examine this possibility, let us consider the examples in(3).

- (3) (a) Lee made her [a doll] and [a dress]. [NP and NP]  
 (b) \*Lee made her[a doll] and [a good wife]. [NP and NP]

Both in(3)(a) and (3)(b) we have two NPs conjoined by *and* but only (3)(a) is acceptable. The unacceptability of (3)(b) is attributed to the different grammatical function each conjunct category carries rather than the identity of syntactic category itself; that is, in (3)(b), the first conjunct NP [a doll] functions as direct object of the verb "made", whereas the second conjunct NP [a good wife] functions differently as predicate NP inside a small clause [her a good wife].<sup>1</sup> This is why (3)(b) is ungrammatical.

This shows that categorial identity(in absolute sense) is not a sufficient condition to ensure the acceptability of coordination, either. Then, eventually we can conclude that categorial identity is neither a necessary nor a sufficient condition on coordination.

However, this does not mean that categorial identity is irrelevant to the condition on coordination. Rather, the observation so far implies that the categorial identity between conjuncts is a crucial condition on coordination. The observations so far suggest to us that in order to define this categorial identity we should consider not only the syntactic category of each conjunct itself but also the grammatical function each conjunct carries out in coordination context.

Unfortunately, however, the story is not so simple. It is not hard to

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<sup>1</sup> Peterson(1981) tried to capture this point in terms of his notion of grammatical functions first introduced by Bresnan. For instance, according to his term, the first conjunct NP [a doll] in (3)(b) functions as second object (NP3) of the verb *make*, but the second conjunct NP [a good wife] functions as objective predicate nominal (NP2)(NP).

imagine that the constraints on coordination cannot be defined solely by the requirement of functional equivalence of each conjunct. Actually, we can easily find the ungrammatical coordinate constructions where two conjoined categories have the same grammatical function. Consider the examples in (4).

- (4) (a) John asked[which book] and [which magazines] Mary wanted?  
 (b) \*John asked[which book] and [these magazines] Mary wanted?  
 (Gazdar et al(1985))

Two conjoined NPs in both(4)(a) and (4)(b) are same in its grammatical function as surface direct object of the verb “wanted” in an embedded clause. Therefore, considering the requirement of functional equivalence of each conjunct, there should be nothing wrong with the coordination in both cases. However, only (4)(a) is acceptable.

This shows that the categorial identity between two conjoinable conjuncts cannot be defined solely by the identity of the grammatical function they have. Rather, the examples in (4) above suggest to us that we should also consider all grammatical properties of each conjunct category relevant to coordination context.

### 3. The Defining Features for Categorial Identity

In the section 2 above, we saw that the categorial identity condition on coordination should be defined relatively, depending on each different syntactic configuration of coordination context where a different kind of categorial identity is required for each conjunct. To capture each different kind of categorial identity between conjuncts, it is useful to resort to GPSG’s view of categories.

In GPSG, categories are viewed as sets of feature-value pairs rather than monadic node labels. The features employed in GPSG reflect all necessary grammatical informations associated with the category as well as the syntactic nature of the category itself. Thus, in GPSG, the fully specified category is the composite of all necessary feature-value pairs. For instance, if each conjunct NP in (4) above is fully specified, then it will be represented as in (5).

- (5) [which book] = {⟨BAR, 2⟩, ⟨N, +⟩, ⟨V, -⟩, ⟨SING, +⟩, ⟨WH, +⟩}

[which magazines]= {⟨BAR, 2⟩, ⟨N, +⟩, ⟨V, -⟩, ⟨SING, -⟩, ⟨WH, +⟩}  
 [these magazines]= {⟨BAR, 2⟩, ⟨N, +⟩, ⟨V, -⟩, ⟨SING, -⟩, ⟨WH, -⟩}

Given the full specification of each category with all necessary feature-value sets, our feature-based analysis can capture some crucial identity between two conjoined categories. Consider the examples in (4) again. In (4)(a) the first conjunct NP [which book] and the second conjunct [which magazines] share the feature [+WH] since they both have wh-word inside NP.

However, in the case of (4)(b), notice that the same feature [WH] is not shared by each conjunct; that is, the first conjunct NP [which book] has the feature [+WH] but the second conjunct NP [these magazines] does not, so the resultant coordinate structure is ungrammatical. Since the feature [WH] here decides whether the given coordinate structure is acceptable or not, it is considered as a defining feature for categorial identity.

However, let us consider another feature [SINGULAR] here. In (4)(a) the first conjunct NP [which book] and the second conjunct NP [which magazines] do not share the feature [+SINGULAR], but still the resultant structure is acceptable. Then what about in (4)(b)? Notice that even though the feature [+SINGULAR] is shared by each conjunct, the resultant coordination is unacceptable. Then, we may say that the feature [+SINGULAR] is not included as a defining feature for categorial identity in this case.

What is important here is to realize that what is central to ensure the acceptability of coordination is not the absolute identity between conjuncts as the same syntactic category, say NP or PP, but a sort of partial identity between them in terms of some defining features for categorial identity. This amounts to saying that in order to have a grammatical coordination each conjunct must share some specific defining feature for categorial identity of conjuncts.

Here the question arises as to what features in GPSG are included as defining features for categorial identity of conjuncts. In the specific system of syntactic features of GPSG, several classes of feature that may be associated with a category are distinguished, among them so-called HEAD features and FOOT features. HEAD features, as the name suggests, are features necessarily associated with heads; for example, the features [N

(oun)] and [V(erb)] identify the part of speech class to which the lexical head of a category belongs. FOOT features, on the other hand, constrain the expansion of a category in certain ways not associated — or, at least, not necessarily associated — with the head. Here is a list of HEAD and FOOT features employed in the recent GPSG framework as in (6).

- (6) HEAD = {N, V, BAR, SING, XSP, THP, CASE, VFORM, PAS,  
 PAST, AUX, INV, PRD, SLASH, AGR, SUBJ}  
 FOOT = {SLASH, REFL, WH}

Here, in order to find what features in GPSG are included as the defining features for categorial identity in coordination, it is worth examining the possibility of a boundary where some specific HEAD or FOOT features are included in defining the categorial identity of conjuncts.

As far as HEAD features are concerned, considering the nature of HEAD feature itself, it is not hard to imagine that there will be no absolute boundary where some specific HEAD features are always included as the defining features for categorial identity of conjuncts. Since HEAD features are necessarily associated with heads and used to identify the part of speech class to which the lexical head of a category belongs, they can be the defining features for categorial identity under some particular context but sometimes not, depending on the subcategorization of a lexical head. For example, consider the following contrast in acceptability between (7)(a) and (7)(b).

- (7) (a) Lee is [a Korean] and [from Seoul].  
           [+N, +PRD]           [-N, +PRD]  
 (b) \*Park got [a prize] and [in the contest]  
           [+N]                   [-N]

The verb 'be' in (7)(a) is introduced by the following ID rule in (8).

- (8) VP- > H[1], X<sup>2</sup>[+PRD]

The ID rule above expresses a subcategorization of a lexical head (i.e., the verb *be*) requiring any unspecified two-level bar category having the feature [+PREDICATIVE]. In (7)(a) both the first conjunct NP [a Korean] and the second conjunct PP [from Seoul] share the feature [+PREDICATIVE] required by the ID rule in (8), so the resultant coordinate structure is

well-formed. Then, we say that the HEAD feature [PREDICATIVE] in this case is a defining feature which is crucial for categorial identity of conjuncts. However, notice that another HEAD feature [+N] is not a defining feature for categorial identity of conjuncts in this case, because even though two conjoinable conjuncts NP and PP do not share the feature [+N] (PP is specified as [-N]), still the resultant coordinate structure is acceptable.

However, in the case of (7)(b), the feature [+N] is a defining feature for categorial identity. The verb "get" subcategorizes differently from the verb "be" and the required ID rule will be introduced as in (9).

(9) VP->H[2], X<sup>2</sup>[+N]

Here, the SUBCAT feature [2] requires only two-level bar category specified by the feature [+N] (that is, NP or AP) as an ARGUMENT of the verb "get." Notice in (7)(b) that the second conjunct category-PP [in the contest] is specified as [-N] while the first conjunct category-NP [the prize] is specified as [+N]. Because of this difference in terms of HEAD feature [+N], the resultant coordinate structure (7)(b) is ungrammatical. In this case the HEAD feature [N] is a defining feature for categorial identity of conjuncts unlike in the case of (7)(a).

Thus, we find that the same HEAD feature [N] is sometimes included as a defining feature for categorial identity of conjuncts but sometimes not, depending on each different ID rule. This means that there is no absolute boundary in HEAD features which says that some specific HEAD features are always included as the defining features for categorial identity of conjuncts.

On the other hand, in the case of FOOT features, it is possible to draw a specific boundary where some specific FOOT features should be included as the defining features for categorial identity of conjuncts.

Let us start with the feature [SLASH].<sup>2</sup> It has been frequently observed in English conjunction that it is unacceptable for a category with an

<sup>2</sup> In GPSG the feature [SLASH] is considered to be both a Head feature and a Foot feature. Its classification does not affect our generalization here since the feature [SLASH] should always be included as a defining feature for categorial identity of conjuncts in English regardless of whether it is classified as Head or Foot feature.

extracted element in it to be conjoined with a category without the corresponding gap. Consider the examples in (10).<sup>3</sup>

- (10) (a) Which books did Robin [read—] and [hate—]?
- VP/NP                    VP/NP
- (b) \*Which books did Robin [talk to Chris] and [read—]?
- VP                            VP/NP
- (c) \*Which books did Robin [read—] and [talk to Chris]?
- VP/NP                    VP
- (from Gazdar et al(1985))

The examples in (10) show that the FOOT feature [SLASH] should be shared by each conjoined category to make coordination structure well-formed. Two conjoined categories in (10)(b) and (10)(c) are different in terms of FOOT feature [SLASH] and that is why two resultant coordinate structures are ungrammatical. However, (10)(a) is acceptable since each conjunct category shares the same FOOT feature ⟨SLASH, NP⟩. This shows that the FOOT feature [SLASH] should be included in the defining features for categorial identity of conjuncts.

Another FOOT feature [WH] illustrated in the list of (6) is also crucial with regard to categorial identity of conjuncts. We already observed this fact in (4) above. A noun phrase with the feature [+WH] can be conjoined with another such noun phrase but not with a noun phrase that lacks this feature. Thus the FOOT feature [WH] should be also included as a defining feature for categorial identity of conjuncts.

There is a third FOOT feature which functions very differently from these two FOOT features above with regard to coordination. That is the feature [REFLEXIVE] associated with constituents that contain a reflexive pronoun. The examples in (11) show that this FOOT feature [+REFLEXIVE] is not a defining feature for categorial identity of conjuncts.

<sup>3</sup> Here it should be noticed that the feature [SLASH] used in GPSG represents “gapping” construction caused by the extraction of some element, and it does not cover the so-called “discourse gap” (e.g., Kim loves Lee and John Mary.). I will not consider this construction for ease of discussion in this paper. As for some of the studies regarding this construction, the reader is recommended to refer to Gazdar et al(1985) or the work in “Combinatory Categorial Grammar”.



(11) (a) John voted [for himself] and [for Mary].

PP[+REFL]        PP

(b) John saw [himself] and [Mary] in the mirror.

NP[+REFL]        NP

Notice in (11)(a) that the second conjunct PP [for Mary] lacks the feature [+REFL] unlike the first conjunct PP [for himself], but the resultant coordinate structure is still grammatical. The same story is also true of (11)(b). This shows that a category containing a reflexive can be coordinated with the one that does not. Thus we found that among all the FOOT features in GPSG only the features [SLASH] and [WH] are included as defining features for categorial identity of conjuncts.

#### 4. A Well-formedness Condition on Coordination

Now, we are in a position to be able to formulate our well-formedness condition on coordination by the feature-based analysis. To do this job, let us summarize what we have found so far.

First, the categorial identity (in absolute sense) is neither a necessary nor a sufficient condition on coordination, but rather the requirement of categorial identity between each conjunct should be defined relatively depending on each different context where a different kind of categorial identity is required for each conjunct.

Second, the best way to define this categorial identity is to define it by using GPSG features. The key observation is that the partial identity in terms of some defining features for categorial identity is crucial to ensure the acceptability of coordination.

Third, the HEAD features are relatively decided as to whether they are included as defining features for categorial identity, depending on the context. Whereas, some FOOT features; namely, [SLASH] and [WH] are always defining features for categorial identity but another FOOT feature [REFL] is not.

Given the observations so far, I propose the following form of well-formedness condition on coordination in English as in (12). And the subsequent definition of “Defining Features for Categorial Identity” is followed in (13)

(12) Well-formedness Condition on Coordination (WCC)

In the following coordinate structure in English,

$$[...X[+\alpha, +\beta, +\gamma...] \text{ and } Y [+\alpha, +\beta, +\delta...]...]$$

where X and Y are any type of category, and  $[+\alpha]$ ,  $[+\beta]$ ,  $[+\gamma]$ , and  $[+\delta]$  are HEAD or FOOT features specified in the category X or Y, the category X and Y should share some set of defining features for category identity between each other (for instance,  $[+\alpha]$  and  $[+\beta]$  in this configuration) in order to be well-formed.

### (13) Defining Features for Categorical Identity

The defining features for categorial identity are some particular HEAD features (which are decided relatively under a specific ID rule required in the context) or two FOOT features ([SLASH] and [WH]) which should be shared by each conjunct category to ensure the acceptability of the coordinate structure.

Given this well-formedness condition on coordination, I hope that we can systematically account for a variety of constraints on coordinate structures in English.

## 5. Closing Remarks

In this paper, I tried to formulate a generalized form of well-formedness condition on coordination in English. To achieve this goal, I discussed a variety of constraints on coordination by *and* in English by the feature-based approach in GPSG framework. I argued that each conjunct category in coordinate construction must share some set of defining features for categorial identity of conjuncts in order to be well-formed. The defining features are those which are crucial in ensuring the well-formedness of a given coordinate construction. We also observed that the HEAD features are relatively decided as to whether they are included as defining features for categorial identity, depending on the context. Whereas, some FOOT features; namely, [SLASH] and [WH] are always defining features for categorial identity but another FOOT feature [REFL] is not.

As far as the observations made throughout the paper are concerned, I think that at least they contribute to clarifying the constraints on coordination in English. However, there are still some remaining problems. My

analysis here does not cover the whole range of coordination data, as implied in introduction section. Above all, my analysis simply lacks the explanation for some other kinds of constraint on coordination which are not purely syntactic but rather semantic and/or pragmatic. This is because our feature-based analysis in GPSG framework is basically a syntactic approach. The possibility of expanding the feature-based analysis to handling semantic and/or pragmatic constraints on coordination remains open.

Besides this general problem in my analysis, there might be some theory-internal problems in my discussion, especially in the generalized form of well-formedness condition on coordination. If there are any such, all are my own.

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**ABSTRACT****The Feature-based Analysis of Constraints on  
Coordination in English: A GPSG Account**

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Since Chomsky (Aspects, 1965) introduced the idea that categories might be composites of syntactic features, this idea has been taken up and further developed in contemporary syntax theories. One of the outstanding advantages of this idea is to be able to give a systematic account of categorial identity between conjuncts in coordinate structure. The paper is designed to formulating generalized form of well-formedness condition on coordination in English by this feature-based approach in GPSG framework. We will observe that the categorial identity between two conjuncts is a crucial factor in deciding the well-formedness of the coordinate structure. It will be argued that this fact is best captured by the condition that some specific set of features must be shared by two conjunct categories to ensure the acceptability of the given coordinate structure. These features will be called as “defining features” for categorial identity. Along this line, it will be also observed that the HEAD features in GPSG are relatively decided as to whether they are included as “defining features,” whereas some FOOT features; namely, the feature [SLASH] and [WH] are always “defining features” for categorial identity but another FOOT feature [REFL] is not.

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