

# A comprehensive theory of coordination of unlikes

Shūichi Yatabe (yatabe@boz.c.u-tokyo.ac.jp), University of Tokyo

## 1 Introduction

The principal aim of this paper is to present a comprehensive theory of coordination of unlikes, i.e., a theory that is capable of dealing with every phenomenon resulting from coordination of unlikes. Previous theories of coordination of unlikes, while more or less successful in dealing with examples like (1) and (2), cannot be said to be comprehensive, as they all fail to account for the existence of a construction type exemplified by (3), in which two or more expressions with distinct agreement features are conjoined and one of them, instead of the coordinate structure as a whole, agrees with something outside that coordinate structure.

- (1) Stupid or a liar is what Pat is.  
(from Munn (2000))
- (2) Sie hat Karl gefunden und geholfen.  
she has Karl found and helped  
'She found and helped Karl.'  
(from Pullum and Zwicky (1986))  
(N.B. The verb *gefunden* subcategorizes for an accusative object while the verb *geholfen* subcategorizes for a dative object.)
- (3) (from Quirk et al. (1985, §10.41))
  - a. Either your brakes or your eyesight is/?are at fault.
  - b. Either your eyesight or your brakes are/?is at fault.

The type of agreement shown in (3) will be referred to as *single-conjunct agreement* in what follows.<sup>1</sup> It will be my contention in this paper that examples like (1), (2), and (3) can, and should, be handled in a unified manner.

During the course of the argumentation, it will also be claimed that certain facts involving coordination of unlikes provide a good reason to adopt the so-called DP hypothesis, according to which the head of a phrase like *this picture* is the determiner, rather than the noun.

## 2 Problems with previous theories

I will begin by reviewing existing theories of coordination of unlikes, taking Bayer's (1996) theory as

<sup>1</sup>There is in fact a considerable amount of intra- and inter-speaker variation in usage of single-conjunct agreement, as documented in Peterson (1986). This variation will be addressed in the full paper, but not in this abstract.

the point of departure. Bayer's theory is couched in the terms of Lambek Categorical Grammar, and is arguably one of the most well-developed of the theories of coordination of unlikes that have been proposed in the literature. However, it has the following three shortcomings.

First, his theory does not provide an explanation as to why sentence (4) is ungrammatical while sentence (5) is grammatical; it incorrectly predicts that both should be grammatical.

- (4)\*Ich habe den Dozenten gesehen und geholfen.  
'I have seen the docent (sg acc) and helped the docents (pl dat)'  
(from Zaenen and Karttunen (1984))
- (5) der Antrag des oder der Dozenten  
(=der Antrag des Dozenten oder der Dozenten)  
'the petition of the docent or the docents'  
(from Eisenberg (1973))

Since the accusative/dative distinction can be neutralized as in (2) and apparently the singular/plural distinction can also be neutralized as in (5), Bayer's theory leads us to expect that (4) should be grammatical as well.

Second, Bayer's theory does not generate a sentence like (6).

- (6) Peter beschreibt den, und Martin beschreibt das Quark.  
(=Peter beschreibt den Quark und Martin beschreibt das Quark.)  
'Peter describes the fresh cheese and Martin describes the quark.'  
(from Hartmann (2000))

The word *Quark* has two senses: with the masculine article, it refers to fresh cheese, while with the neuter article, it refers to an elementary particle. This is clearly a case of ambiguity, not neutrality, but right-node raising is still possible.

Third, his theory is not capable of dealing with single-conjunct agreement, a phenomenon exemplified by (3) above. This is because the linear order between conjuncts cannot have any significance in Bayer's theory; a coordinate structure of the form [DP<sub>PL</sub> or DP<sub>SING</sub>], for instance, is given exactly the same status as a coordinate structure of the form [DP<sub>SING</sub> or DP<sub>PL</sub>], making it impossible to capture the fact that the former, but not the latter, can serve as the subject of a VP such as *is at fault*.

Bayer (1996) notes the first and the third of these problems himself, but does not offer solutions for

them. Dalrymple and Kaplan (2000), Daniels (2002), Levy and Pollard (2002), and Sag (2003) represent interesting attempts to improve on Bayer’s theory, but they do not offer new insight regarding these three problems.

The phenomenon of single-conjunct agreement has been given an HPSG-based analysis by Moosally (1999). However, Moosally’s analysis, in which the INDEX value of a coordinate structure is required to be identical with the INDEX value of only one of its conjunct daughters, fails to extend to cases involving what Munn (2000) calls mixed agreement, a situation in which one coordinate structure shows a mixture of two or more agreement patterns. (7) and (8) are English examples that involve mixed agreement. In (8), for example, the conjoined determiners *five or one* agrees with the following *singular* noun and the preceding *plural* verb at the same time. (Munn (2000) and Sadler (2003) discuss Brazilian Portuguese and Welsh examples of an analogous nature respectively.)

- (7) Therefore there are either three or one real positive solution to the equation.
- (8) The five-bed detention center costs Ward County \$436.45 per day, whether there are five or one juvenile a day.

This type of example cannot be handled properly by Moosally’s theory, let alone Bayer’s theory.<sup>2</sup>

Incidentally, notice here that examples like (7) and (8) constitute *prima facie* evidence for the DP hypothesis. In (8), for instance, the verb *are* agrees with the first half of the conjoined determiners *five or one*, but it does not agree with the noun *juvenile*. I take this to mean that the head of the phrase *five or one juvenile* is not *juvenile* but *five or one*.

### 3 The grammar of constituent coordination

In this section, I will present a novel theory of coordination of unlikes and show that it is as successful as Bayer’s theory in dealing with examples like (1) and (2). The way the theory circumvents the three problems that plague Bayer’s theory will be explained in sections 4 and 5 below.

<sup>2</sup> Examples like (7) and (8) do not pose a problem for Sadler’s (2003) LFG-based theory of single-conjunct agreement. However, as will be shown in the full paper, it is difficult to reconcile the type of theory Sadler describes with the following facts, noted in Morgan (1984).

- (i) There ??was/??were a man and two women sunning themselves on the patio.
- (ii) There were two women and a man sunning themselves on the patio.

The following is the gist of the proposed theory.

- (9) Suppose that a coordinate structure  $M$  is made up of  $n$  conjunct daughters,  $d_1 \cdots d_n$  from left to right. Then the following must hold.

- (i) The HEAD value of  $M$  is

$$\left[ \begin{array}{l} \text{CONJ } \boxed{0} \\ \text{ARGS } \langle \boxed{1}, \dots, \boxed{n} \rangle \end{array} \right],$$

where  $\boxed{1} \cdots \boxed{n}$  are the HEAD values of  $d_1 \cdots d_n$  respectively, and  $\boxed{0}$  is the SYNSEM|CONT|KEY|RELN value of  $M$ .

- (ii) The VALENCE value of  $M$  is identical to the VALENCE value of each of the conjunct daughters,  $d_1 \cdots d_n$ .

I assume that MOD is a VALENCE feature, not a HEAD feature (Yatabe (2003)).

On this account, the SYNSEM|CAT value of the phrase *stupid or a liar* in example (1) is claimed to be as shown in (10) (assuming that a predicative nominal has a subject slot that is not overtly filled).  $\boxed{1}$  and  $\boxed{2}$  are the HEAD values of the AP *stupid* and the DP *a liar* respectively.

$$(10) \left[ \begin{array}{l} \text{HEAD } \left[ \begin{array}{l} \text{CONJ } \text{or} \\ \text{ARGS } \langle \boxed{1} \text{adj}, \boxed{2} \text{det} \rangle \end{array} \right] \\ \text{VALENCE } \left[ \begin{array}{l} \text{SUBJ } \langle \text{DP} \rangle \\ \text{COMPS } \langle \rangle \end{array} \right] \end{array} \right]$$

Given this analysis of constituent coordination, it is trivially easy to account for the existence of sentences like (1) above and (11) below, which involve coordination of unlike arguments; all that needs to be done is to set up lexical entries such as the one shown in Figure 1, which take into account the fact that subjects and complements they take may turn out to involve coordination.

- (11) We emphasized Mr. Colson’s many qualifications and that he had worked at the White House. (from Bayer (1996))

Notice that the only aspect in which Figure 1 deviates from what is standardly assumed in HPSG is the use of the functor symbol  $c$  within the specification of the subcategorization frame. The meaning of the functor symbol  $c$  is defined in (12) below. Roughly speaking,  $c(\alpha)$  is an appropriate description of an object  $X$  if and only if either  $\alpha$  is an appropriate description of  $X$  or  $X$  is a possibly nested ‘coordinate structure’ such that  $\alpha$  is an appropriate description of each of its ‘conjuncts’. The lexical entry in Figure 1 is in effect saying (i) that the subject of this verb

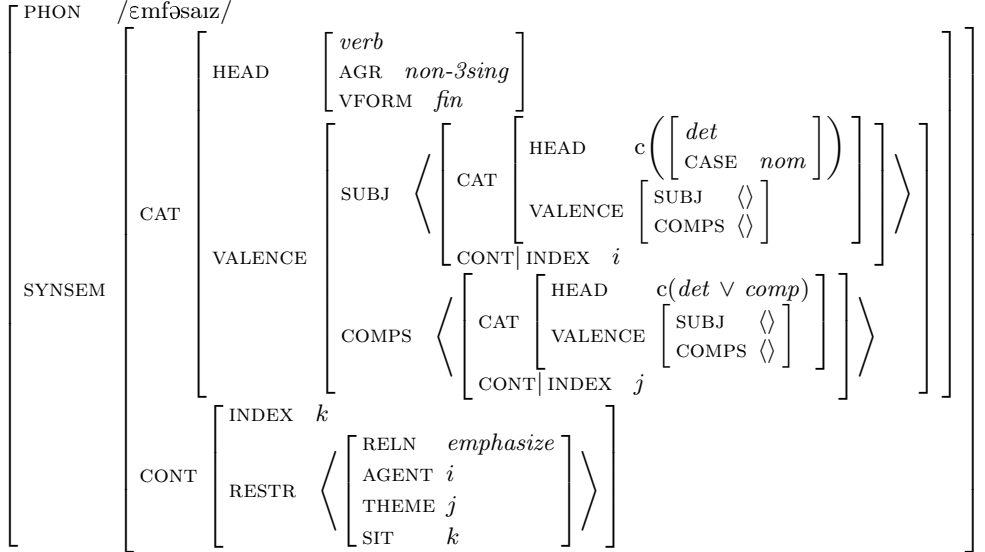
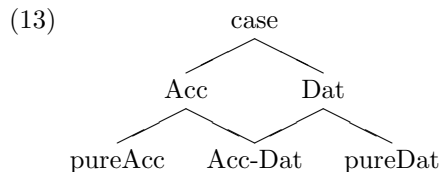


Figure 1: Part of the lexical entry for *emphasize*

must be either a nominative DP or a possibly nested coordinate structure whose conjuncts are all nominative DPs and (ii) that the complement of this verb must be a DP, a CP, or a possibly nested coordinate structure each of whose conjuncts is either a DP or a CP.

$$(12) \boxed{1} : c(\alpha) \equiv \begin{array}{l} \boxed{1} : \alpha \\ \vee \left( \boxed{1} : \left[ \text{ARGS } \langle \boxed{a_1}, \dots, \boxed{a_n} \rangle \right] \right. \\ \quad \left. \wedge \boxed{a_1} : c(\alpha) \wedge \dots \wedge \boxed{a_n} : c(\alpha) \right) \end{array}$$

The proposed theory also successfully accounts for an example like (2), which involves coordination of unlike predicates, when combined with Levine et al.'s (2001) theory of case syncretism. Specifically, example (2) can be dealt with by introducing a new sort, say, *Acc-Dat*, as a subsort of both *Acc* and *Dat*, as shown in (13). (In this illustration, I ignore cases other than the accusative case and the dative case.)



Since the VALENCE value of the coordinate structure *gefunden und geholfen* in (2) is by assumption identical both to the VALENCE value of *gefunden* and to the VALENCE value of *geholfen*, it is correctly predicted that the coordinate structure subcategorizes for a DP whose CASE value is *Acc-Dat*.

As will be demonstrated in section 5 below, the proposed theory is capable of dealing with single-conjunct agreement as well, because the linear order between conjuncts is reflected in the HEAD value of the coordinate structure as a whole. Moreover, the theory proposed above provides us with a means to capture the contrast illustrated in (14) below, noted in Büring (2002).

- (14) a. one of us/\*one of you and me  
b. one of the detectives/\*one of Schimansky and Tanner

On the proposed account, it is possible to distinguish the grammatical cases and the ungrammatical cases by stipulating that this use of *of* subcategorizes for a plural DP or a coordinate structure made up of plural DPs, and not for a coordinate structure made up of singular DPs. Such a straightforward account is not available in other theories, where a phrase of the form  $[\text{DP}_{\text{SING}} \text{ and } \text{DP}_{\text{SING}}]$  is (or at least can be) given the same status as a plural DP.

#### 4 Right-node raising

In this section, I will show how the present theory resolves the first two of the three problems that beset Bayer's theory, i.e., the contrast between (4) and (5) and the grammaticality of (6).

The grammaticality of (6) is in fact no mystery if we adopt a theory of RNR such as the one presented in Yatabe (2001), according to which two or more phonologically identical expressions can sometimes be RNRed together even if they are syntacti-

cally and semantically distinct from each other. Since the word *Quark* ‘fresh cheese’ and the word *Quark* ‘quark’ are phonologically identical, they are allowed to be RNRed together, even though they are syntactically and semantically distinct.

The contrast between (4) and (5) can be accounted for as follows. Like (6), (5) is generated by applying the purely phonological type of RNR to a conjunct-final material. On the other hand, in (4), the word *Dozenten* is not conjunct-final and thus cannot be regarded as having undergone RNR. Therefore, in this example, one and the same word (*Dozenten*) is required to be ‘singular and accusative’ with respect to the first conjunct and ‘plural and dative’ with respect to the second conjunct. I suggest that we should systematically rule out examples of this type by disallowing simultaneous feature neutralization in two or more dimensions (e.g. the dimension of number and the dimension of case). Note that the word *Dozenten* clearly should not be allowed to be ‘singular, plural, accusative, and dative at the same time’, because that would incorrectly predict that the word can function as something that is ‘singular and dative’ as well. Thus example (4) is in fact correctly ruled out by the ban against simultaneous feature neutralization in two or more dimensions, which entails that, while there might be sorts such as *Acc-Dat* (see above) and *Singular-Plural*, there cannot be sorts such as *SingularAcc-PluralDat*.

Daniels (2002, section 4D) has proposed a theory that in effect allows simultaneous feature neutralization in two or more dimensions, but for now it seems reasonable to reject this type of theory, as there is no clear evidence that it is possible to neutralize two dimensions of distinctions simultaneously. The Finnish example in (15) and the German example in (16) have been adduced in the literature as examples involving simultaneous feature neutralization in two dimensions (the dimension of number and that of case in (15) and the dimension of number and that of person in (16)), but both of them can be reanalyzed as involving the purely phonological type of RNR, which I invoked above for examples (5) and (6).

- (15) He lukivat hänen uusimman \_\_\_\_\_ ja me  
 they read his newest (sg gen) and we  
 hänen parhaat \_\_\_\_\_ kirjansa.  
 his best (pl nom) book/books  
 (from Zaenen and Karttunen (1984))

- (16) ... weil ihr das Haus und Franz den Garten  
 kauft.  
 ‘... because you(pl.) buy the house and Franz  
 buys the Garden.’

(from Pullum and Zwicky (1986))

## 5 Single-conjunct agreement

In this final section, I will describe how the proposed theory accounts for the phenomenon of single-conjunct agreement, taking subject-verb agreement in English as an example.

The account that I suggest consists of the following hypotheses. First, VPs and DPs are both equipped with a HEAD feature called AGR, whose value indicates whether the expression involved is 3rd person singular or not, etc. (Kathol (1999)). Second, subject-verb agreement is enforced by requiring a certain relation to hold between the HEAD values (especially the HEAD|AGR values) of a VP and its subject (as proposed by Kathol (1999) for German but not for English). Third, the constraint that enforces subject-verb agreement is not stated in the lexicon and instead is given as a non-lexical, syntactic constraint (Yatabe (2003)). Fourth, nouns can be constructed on the fly which end with a plurality marker (-s) but whose SYNSEM|CAT|HEAD|AGR|NUM value is *singular*. This fourth hypothesis is needed to handle examples like (17), discussed in Pollard and Sag (1994) and Kathol (1999).

- (17) Did that hash browns at table nine leave a tip?

Fifth, there are (at least) two lexical entries for the word *and*, both of which can be used to conjoin DPs: one entry whose function is to form a DP with a plural index and another one whose function is to form a DP with a singular index. The former is used in a sentence like (18) and the latter is used in sentences like (19) and (20).

- (18) Mary and John were criticizing themselves.  
 (19) His aged servant and the subsequent editor of his collected papers was with him at his deathbed. (from Quirk et al. (1985, §10.39))  
 (N.B. The servant and the editor are the same person.)  
 (20) Every adult and every child was holding a flag.  
 (from Quirk et al. (1985, §10.37))

And sixth, the relation that is required to hold between the HEAD values (including the HEAD|AGR values) of a VP and its subject, which I will call the *subj\_verb\_agreement* relation, is defined as in (21). The two arguments of this relation are the HEAD values of a VP and its subject, respectively.

- (21) *subj\_verb\_agreement* ( $\boxed{1}$ ,  $\boxed{2}$ )  $\equiv$   
 $\left( \boxed{1} : c \left( \left[ \text{AGR} \left[ \text{PER} \boxed{3} \right] \right] \right) \right)$

$$\begin{aligned}
& \wedge \boxed{2} : \left[ \text{AGR} \left[ \begin{array}{c} \text{PER } \boxed{3} \\ \text{NUM } \boxed{4} \end{array} \right] \right] \\
\vee & \left( \begin{array}{l} \boxed{1} : c \left( \left[ \begin{array}{c} \text{INV } - \\ \text{AGR} \left[ \begin{array}{c} \text{PER } \boxed{3} \\ \text{NUM } pl \end{array} \right] \end{array} \right] \right) \\ \wedge \boxed{2} : \left[ \text{CONJ } plural\text{-and} \right] \\ \wedge \dots \end{array} \right) \\
\vee & \left( \begin{array}{l} \boxed{1} : c \left( \left[ \begin{array}{c} \text{AGR} \left[ \begin{array}{c} \text{PER } \boxed{3} \\ \text{NUM } sg \end{array} \right] \end{array} \right] \right) \\ \wedge \boxed{2} : \left[ \text{CONJ } singular\text{-and} \right] \\ \wedge \dots \end{array} \right) \\
\vee & \left( \begin{array}{l} \boxed{1} : c ([\text{INV } -]) \\ \wedge \boxed{2} : \left[ \begin{array}{c} \text{CONJ } or \\ \text{ARGS } \langle \boxed{a_1}, \dots, \boxed{a_n} \rangle \end{array} \right] \\ \wedge subj\_verb\_agreement \left( \boxed{1}, \boxed{a_n} \right) \end{array} \right) \\
\vee & \left( \begin{array}{l} \boxed{1} : c ([\text{INV } +]) \\ \wedge \boxed{2} : \left[ \text{ARGS } \langle \boxed{a_1}, \dots, \boxed{a_n} \rangle \right] \\ \wedge subj\_verb\_agreement \left( \boxed{1}, \boxed{a_1} \right) \end{array} \right) \\
\vee & \dots
\end{aligned}$$

*plural-and* and *singular-and* are the names of the relations expressed by the two lexical entries for *and* mentioned above. Note that the fourth and the fifth disjunct in the right-hand side of definition (21) allow for the possibility of single-conjunct agreement. (The full paper will present a more complete account which can handle examples like (7) and (8) as well.)

## 6 Conclusion

In this paper, it has been argued that it is possible to develop an HPSG-based theory that handles the phenomenon of coordination of unlikes and the phenomenon of single-conjunct agreement in a unified manner. In the course of the argumentation, it has also been argued that certain facts involving coordination of unlikes provide an unexpectedly straightforward piece of evidence for the DP hypothesis.

## References

- Bayer, Samuel: 1996, 'The coordination of unlike categories,' *Language*, 72, pp. 579–616.
- Büring, Daniel: 2002, '2 × singular ≠ plural,' *Snippets*, 6, pp. 6–7. <http://www.ledonline/snippets/>
- Dalrymple, Mary, and Ronald M. Kaplan: 2000, 'Feature indeterminacy and feature resolution,' *Language*, 76, pp. 759–798.
- Daniels, Michael W.: 2002, 'On a type-based analysis of feature neutrality and the coordination of unlikes,' Frank Van Eynde, Lars Hellan and Dorothee Beermann, eds.,

- The Proceedings of the 8th International Conference on HPSG*, CSLI, pp. 137–147.
- Eisenberg, Peter: 1973, 'A note on "identity of constituents",' *Linguistic Inquiry*, 4, pp. 417–420.
- Hartmann, Katharina: 2000, *Right Node Raising and Gapping: Interface conditions on prosodic deletion*, John Benjamins, Amsterdam.
- Kathol, Andreas: 1999, 'Agreement and the syntax-morphology interface in HPSG,' in R. D. Levine and G. M. Green, eds., *Studies in Contemporary Phrase Structure Grammar*, Cambridge University Press, Cambridge, pp. 223–274.
- Levine, Robert, Thomas Hukari, and Michael Calcagno: 2001, 'Parasitic gaps in English: Some overlooked cases and their theoretical implications,' in Peter Culicover and Paul Postal, eds., *Parasitic Gaps*, MIT Press, Cambridge, Massachusetts, pp. 181–222.
- Levy, Roger, and Carl Pollard: 2002, 'Coordination and neutralization in HPSG,' in Frank Van Eynde, Lars Hellan and Dorothee Beermann, eds., *The Proceedings of the 8th International Conference on HPSG*, CSLI, pp. 221–234.
- Moosally, Michelle, J.: 1999, 'Subject and object coordination in Ndebele: An HPSG analysis,' *WCCFL 18*, pp. 379–392.
- Morgan, Jerry L.: 1984, 'Some problems of agreement in English and Albanian,' in Claudia Brugman et al., *Proceedings of the Tenth Annual Meeting of the Berkeley Linguistics Society*, BLS, pp. 233–247.
- Munn, Alan: 2000, 'Three types of coordination asymmetries,' in Kerstin Schwabe and Ning Zhang, eds., *Ellipsis in Conjunction*, Niemeyer, Tübingen, pp. 1–22.
- Peterson, Peter G.: 1986, 'Establishing agreement with disjunctively conjoined subjects: Strategies vs principles,' *Australian Journal of Linguistics*, 6, pp. 231–249.
- Pollard, Carl, and Ivan A. Sag: 1994, *Head-Driven Phrase Structure Grammar*, University of Chicago Press, Chicago.
- Pullum, Geoffrey K., and Arnold M. Zwicky: 1986, 'Phonological resolution of syntactic feature conflict,' *Language*, 62, pp. 751–773.
- Quirk, Randolph, Sidney Greenbaum, Geoffrey Leech, and Jan Svartvik: 1985, *A Comprehensive Grammar of the English Language*, Longman, London.
- Sadler, Louisa: 2003, 'Coordination and asymmetric agreement in Welsh,' in Miriam Butt and Tracy Holloway King, eds., *Nominals: Inside and Out*, CSLI, Stanford, pp. 85–117.
- Sag, Ivan: 2003, 'Coordination and underspecification,' in Jong-Bok Kim and Stephen Wechsler, eds., *Proceedings of the 9th International Conference on HPSG*, CSLI, pp. 267–291.
- Yatabe, Shūichi: 2001, 'The syntax and semantics of left-node raising in Japanese,' in Dan Flickinger and Andreas Kathol, eds., *Proceedings of the 7th International Conference on HPSG*, CSLI, Stanford, pp. 325–344.
- Yatabe, Shūichi: 2003, 'A linearization-based theory of summative agreement in peripheral-node raising constructions,' in Jong-Bok Kim and Stephen Wechsler, eds., *Proceedings of the 9th International Conference on HPSG*, CSLI, Stanford, pp. 325–344.
- Zaenen, Annie, and Lauri Karttunen: 1984, 'Morphological non-distinctiveness and coordination,' Gloria Alvarez, Belinda Brodie, and Terry McCoy, eds., *Proceedings of the First Eastern States Conference on Linguistics*, pp. 309–320.