

Dependency Structure vs. Phrase Structure : Two Analyses of English Determiners *

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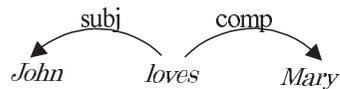
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1 Introduction

In this paper, we will be concerned with two types of syntactic representations. Phrase structure has been adopted as the basis for sentence structure by most syntactic theories. In phrase structures, individual words combine to form constituents. However, Word Grammar (henceforth WG: Hudson 1984, 1990, 2003a, 2007) does not acknowledge any unit larger than a word, and employs dependency structure instead. In this framework, all relationships are word-based. Dependencies and phrases are alternative ways of representing relationships between words. Some believe that dependency structure and phrase structure are merely notational variants (Gaifman 1965; Robinson 1970). There are, however, significant differences between the two. (1) is an example of de-

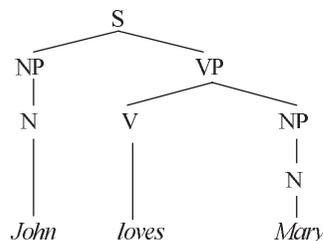
pendency structure notation used in WG.

(1) Dependency structure



WG is a monostratal grammatical framework, and it dispenses entirely with multiple levels of syntactic representations and transformations that mediate among them. Grammatical relations or functions are shown by explicit labels, such as 'subj(ect)' and 'comp(lement)'. Dependency structure is a pure representation of relations between head and dependent. The head is shown as the tail of an arrow, and the dependent is at the point.¹ Note that the number of nodes is in a one-to-one correspondence to the number of words in the sentence: (1) has three nodes and the sentence which it represents has three words. Consider the corresponding phrase structure in (2).

(2) Phrase structure



There are seven nodes in this phrase structure: S, two NPs, two Ns, VP and V. Note that the dependency structure in (1) has just three nodes. This means that dependency structures are simpler than phrase structures. Furthermore, Hudson (2007: 118) states that ‘each word that has at least one dependent is the head of a phrase which consists of that word plus (the phrases of) all its dependents’, meaning that phrases are implicit in the dependency structure. If phrase structures can be derived from dependency structures, phrases are redundant. It looks as though dependency structure should be chosen as a basis for syntactic representation rather than phrase structure.

Another difference between dependency structure and phrase structure is that the former can represent mutual dependency but the latter cannot. The WG analysis of extraction of *wh*-words assumes mutual dependency between the *wh*-word and the verbal head. Let us take the dependency structure of a *wh*-question *What happened?* for example. The *wh*-pronoun *what* is the subject of the verb *happened*, and a verb’s subject is one of its dependents. This means that *what* must depend on *happened*. However, there is also evidence that the verb depends on the *wh*-word. Hudson (1990: 361–382; 2003b; 2004) argues that the verb is a complement of the *wh*-pronoun and thus depends on it. Firstly, the *wh*-pronoun can occur without the verb as in (3), but (4) shows that the verb cannot appear without the *wh*-pronoun. These examples are from Hudson (2004: 30).

(3) Something terrible has happened, but I don’t know what.

(4) *I don’t know what is going to happen, but I do know happened already.

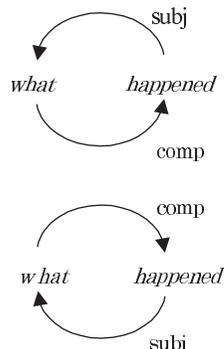
Secondly, predicates such as *wonder* and *sure* require a *wh*-word (or *whether* or *if*) as its complement. In (5) and (6), cited from Hudson (2003b: 633), this requirement is satisfied by *who* and *what*, not *come* and *happened*. In these sentences what is selected by the higher verb is the *wh*-word, so the verb must depend on it in the subordinate clause.

(5) I wonder *(who) came.

(6) I’m not sure *(what) happened.

What emerges from these pieces of evidence is that *what* and *happened* depend on each other. In the framework of WG, the dependency structure may be either of the two diagrams in (7).

(7)



Thus, *wh*-interrogatives may involve a mutual dependency (Hudson 1990: 361–382, 2003b, 2007: 142). WG has analysed *wh*-relatives, *that*-relatives and free relatives

in this fashion (Hudson 1990 : 383ff, 2003 a). We will also see that WG treats the relation between determiners and nouns in terms of mutual dependency. Such an analysis where two words are interdependent is not possible in phrase structure frameworks.

It seems, then, that we have good reason for adopting dependency structure rather than phrase structure as the basis for syntactic representation.

The goal of this paper is to compare Hudson's (2004) dependency-based account of English determiners in WG with Van Eynde's (2005, 2006) phrase-based account in Head-Driven Phrase Structure Grammar (henceforth HPSG : Pollard and Sag 1987, 1994). We will show that in an empirically adequate analysis of English determiners the role of head must be dissociated from the role of selector. We will argue that this conclusion leads to ruling out the dependency account.

The organisation of the paper is as follows. In section 2, we consider how WG deals with the determiners. Section 3 then look at the HPSG analysis of determiners put forth by Van Eynde (2005, 2006). In the final section, we offer some concluding remarks.

2 Determiners in WG

In this section we will consider two kinds of data. In 2.1 we will look at evidence which might show that determiners depend on nouns ; in 2.2 we will look at evidence for the opposite conclusion. The examples in this section are cited from Hudson (2004) unless otherwise indicated.

2.1 D depends on N

Hudson (2004) argues that D depends on N mainly based on Van Langendonck's (1994) evidence. According to Van Langendonck (1994 : 250), the head of NP adjuncts is the noun rather than the determiner. He points out that the meaning of the noun decides if the NP adjunct is possible. The eligible nouns refer to times (8), places (9) and manners (10).²

(8) I overslept *each morning*.

(9) Put it *this side of the line*.

(10) It's best to do it *my way*.

(11) is not acceptable because the noun does not belong to any of the above semantic categories.

(11) *I overslept *each house*.

Whether or not NP adjuncts are possible is not only decided by the meaning of the noun concerned. It is also decided by the noun itself. Consider (12).

(12) I did it the usual *way/*manner*.

(12) shows that *way* can be used as an adjunct although its synonym *manner* cannot. Similarly, the noun cannot be replaced by a personal pronoun such as *it*.

(13) I saw him this *morning*.

(14) *I saw him *it*.

The above facts show that whether or not a noun can be used in an NP adjunct depends on the noun involved and on its meaning. Therefore, it is quite reasonable

to say that the noun rather than the determiner is the head of NP adjuncts.

Second, singular, countable common nouns need determiners, but others do not. This means that whether D is necessary or not is decided by N.

Third, common nouns allow no more than one determiner in English. This is quite similar to verbs and prepositions which typically allow no more than one complement.

Finally, let us consider extraposition from NP. The NP *people who have been waiting ten years* is continuous in (15), but the relative clause is extraposed in (16).

(15) People [who have been waiting ten years] are still on the list.

(16) People are still on the list [who have been waiting ten years].

However, extraposition is not possible if the antecedent noun (*people*, in this case) is deeply embedded (Hudson 2004 : 20).

(17) *Names of people are still on the list [who have been waiting ten years].

This means that extraposition is only allowed if the antecedent noun is a direct dependent of the verb to which the relative clause is attached (*are*, in this case). Now, look at the following data.

(18) Some people are still on the list [who have been waiting ten years].

If *people* depends on *some* in (18), extraposition should be prohibited in the same

way as (17), where extraposition is blocked by *names of*. The grammaticality of this example shows that *people*, rather than *some*, is a direct dependent of the verb. If the head of a phrase is, as Hudson (2004 : 12) defines, the word which is associated with words outside that phrase, the head of *some people* should be *people*, not *some*.

It seems, then, we can conclude that D must depend on N.

2.2 N depends on D

We have seen some evidence that D depends on N. In this subsection, however, we will look at some data that lead us to the opposite conclusion : N depends on D. Hudson (2004) gives three kinds of evidence.

Many European languages allow a preposition and a definite article to fuse into a single word form. One example is French *du*, which is a fusion of a preposition *de* and a definite article *le*.

(19) du (= de le) village 'from the village'

This fusion only occurs in a PP where the article introduces an NP which is the complement of the preposition. Let us compare this with the infinitival clause *le voir hier* in (20), where it is impossible to fuse *de le* into *du*.

(20) J'ai oublié de le voir hier.

I have forgotten of him to-see yesterday
'I forgot to see him yesterday.'

Assuming that all the definite articles can

be used as object pronouns in French, *le* in (20) is the direct object of the infinitival verb *voir*, which in turn depends on the preposition *de*. Here it is impossible to fuse *de le* into *du* because the article depends on the infinitive rather than the preposition. The contrast between the above two cases shows that the fusion of *le* and *de* occurs only if the former is a dependent of the latter. One example of such fusion can be found in some dialects of English. In these dialects, *to* and *the* can be fused into a glottal stop.

(21) I'm going [ʔ] pub.

This is the same fusion pattern as can be seen in the other languages, and evidence of a direct relation between the preposition and the article.

Secondly, some determiners need N but others do not.

(22) I looked for spots but couldn't find *any*.

(23) I found some old books and I read *every** (one).

This means that whether N is necessary or not is decided by D.

Third, let us consider the semantics of elided N.

(24) We've run out of sugar, so we'd better get some [= some sugar].

The elided noun anaphorically refers to the antecedent (i.e., *sugar* in (24)). Such ellipsis, what Hudson (2004 : 26) calls

'anaphoric ellipsis', typically occurs in dependents.

(25) I found this shoe by the case so I put it *in* [= in the case].

(26) I turned on the television and *watched* [= watched it] for a few minutes.

In these examples, the missing noun is the complement of the preceding preposition (25) and verb (26). However, anaphoric ellipsis cannot occur in heads.

(27) *He sat on the floor and she lay the bed [= on the head].

(28) *I found the second clue before Mary the first [= Mary found the first].

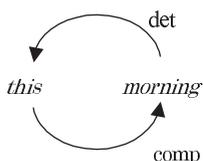
Examples (25) to (28) show that anaphoric ellipsis is only possible in dependents. Therefore, we can conclude that the elided noun in (24) (and also (22)) is a dependent of *some*. It follows that N depends on D.

From these three kinds of evidence, Hudson (2004) concludes that N must depend on D.

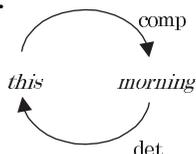
2.3 Mutual dependency

On the basis of such examples as above, Hudson (2004 : 30) concludes that N and D depend on each other. This means that NPs involve a mutual dependency, just like *wh*-interrogatives observed earlier. Either N or D can be the head of the NP. The dependency structure may be either of the two diagrams in (29).

(29) a.



b.

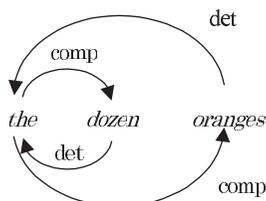


Hudson (2004 : 35ff) applies this mutual dependency analysis to the examples of the following kind.

(30) I bought *the dozen oranges* that we needed.

It is clear that the definite determiner *the* belongs to *oranges*. Interestingly, *the* must also be the determiner of *dozen* because it is a singular countable common noun and must have some determiner. Therefore, the dependency structure of *the dozen oranges* is something like the following.

(31)



The mutual dependency analysis is applied twice here : *the* is the determiner for both *dozen* and *oranges* ; at the same time, both *dozen* and *oranges* depend on *the* as a complement.

2.4 Problems

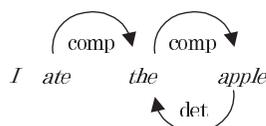
The first problem has been pointed out by

Van Eynde (2006 : 142) : ‘It should be decided for each particular noun phrase whether its head is the determiner or the noun.’ Presumably this is not problematic for the cases where it is possible to clearly decide whether the head of the phrase is N or D. For example, in (12), which is repeated here as (32), the verb *did* must have a direct relation with *way*, rather than *the*, as its adjunct. If a head of a phrase is the word which links to words outside that phrase, then the noun *way* is the head.

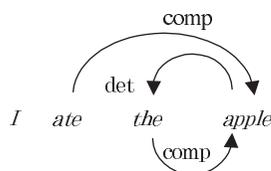
(32) I did it the usual *way/manner*.

However, let us consider a normal noun phrase in such sentences as *I ate the apple*. There are two possible analyses for this sentence.

(33) a.



b.



There is nothing to decide which of these two structures is correct. This means that it is impossible to determine whether *the* or *apple* is the head.

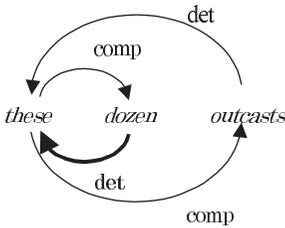
The second problem is related to examples of the following sort.

(34) Secondly, let me suggest what *these*

dozen outcasts will do ; get dirty!

The singular countable nouns *dozen* must have some kind of determiner, and *these* is the only choice in (34). The dependency structure of *these dozen outcasts* is as follows (Hudson 2006 : 36).

(35)



In (35), which is essentially the same as (31) for *the dozen oranges*, the determiner of *dozen* is *these*. Note, however, that there is a mismatch between the singularity of *dozen* and the plurality of *these*. Examples like the following have the same kind of problem.

(36) *these kind of dogs.*

The singular countable nouns *kind* must have a determiner, and in (36) *these* is the only choice. Again, there is a mismatch between the singularity of *kind* and the plurality of *these*.

It seems, then, that a WG analysis of noun phrases in terms of mutual dependency has some problems.

3 Determiners in HPSG

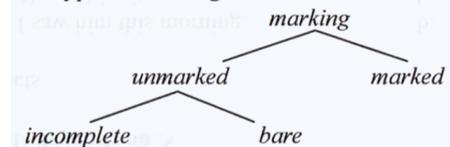
In this section, we will see the HPSG analysis of determiners put forth by Van Eynde (2005, 2006). Some important concepts and notations of HPSG, particularly

those concerned with representing word order, will also be introduced.

3.1 Assumptions

Head-driven Phrase Structure Grammar (HPSG ; Pollard and Sag 1987, 1994) is a monostratal and nonderivational grammatical framework like WG. In this framework, each linguistic object belongs to certain types and those types are organised in the form of hierarchies. These type hierarchies allow properties shared between different types to be spelled out just once : generalisations that hold for subtypes can be just specified for the supertype. Words and phrases are represented as a complex of phonological, syntactic, and semantic information in terms of typed feature structures. The features which are relevant for the purpose of this paper are HEAD and MARKING. The value of the HEAD feature contains information shared between mother and head daughter, information such as parts of speech. The value of MARKING feature is shared between mother and non-head daughter. Van Eynde (2005, 2006) proposes that the value of MARKING is a subtype of *marking*, and the inventory of values which he employs is the following.

(37) Subtypes of marking

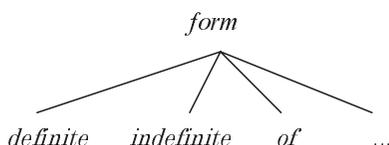


Nominals are *marked* if they contain a determiner, and *unmarked* otherwise. The *unmarked* value has two subtypes, *bare* and

incomplete. Nominals are *bare* if they have no determiner and can freely be used in NP positions, and *incomplete* if they have no determiner and are inherently incomplete.

Associated with the type *marking* is the feature FORM (Van Eynde 2005, 2006). This feature takes the values of type *form*, whose inventory is as follows.

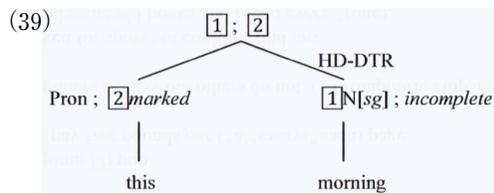
(38) Subtypes of *form*



The value *indefinite* is assigned to all the unmarked nominals, the indefinite pronouns and the indefinite determiners. The value *definite* is assigned to the proper nouns, the personal pronouns, the definite articles, and the demonstrative and possessive determiners. The subtype which is mostly relevant for our purpose is *of*, which we discuss later on.

Crucial for Van Eynde's (2005, 2006) HPSG treatment of determiners is the notion 'functor' (Allegranza 1998; Van Eynde 1998). Functors select a head sister. This means that the role of head is dissociated from that of selector in that a non-head daughter selects a head, rather than the other way round. It also provides its MARKING value for the dominating node. The functors include such things as determiners, pre-nominal modifiers and certain nominals. For example, the demonstrative pronoun *this* is a functor which selects a singular countable noun as its head, and provides its MARKING

value *marked* for the dominating node.

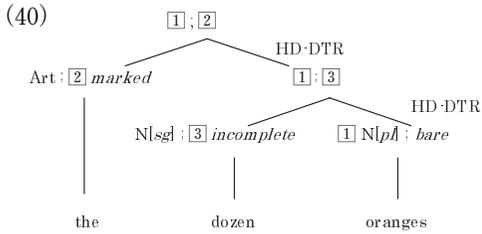


In this and other HPSG notations in this section, only the HEAD value and the MARKING value are provided for each node. Following Van Eynde (2005), the two values are separated by a semicolon. The integers in the square brackets, or 'tags', express token-identity, indicating that the same objects appear in more than one position in the representation. The noun *morning* is singular (indicated as *sg*); it is also incomplete because it needs some kind of determiner to be well-formed. Since it is the head daughter, its HEAD value, indicated as [1], is shared with the dominating node. Its MARKING value, however, is not shared with the mother. The MARKING value of the mother node is shared with that of the non-head daughter: the demonstrative pronoun *this* is inherently marked, so its mother is marked.

Having introduced some relevant features and constraints of HPSG, we will now see how the data discussed in section 2 are analysed in this framework.

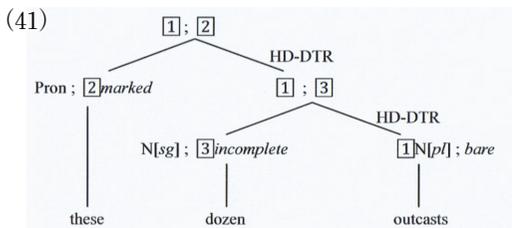
3.2 Application

The NP *the dozen oranges* in (30) has the structure given in the following.



The noun *oranges* is plural (indicated as *pl*) and bare. Since it is the head daughter, its HEAD value is shared by the dominating node. The noun *dozen* is a functor which selects a plural countable noun as its head. As a singular countable noun, *dozen* provides its MARKING value *incomplete* for the dominating node. The combination of *dozen* and *oranges*, then, yields a nominal which is plural and incomplete. Its incompleteness shows that it is not well-formed in itself. In order to be well-formed, it needs some determiner. This has to be a determiner which is also compatible with the plurality of the nominal. The definite article *the* is such a determiner. The resulting NP is marked and plural.

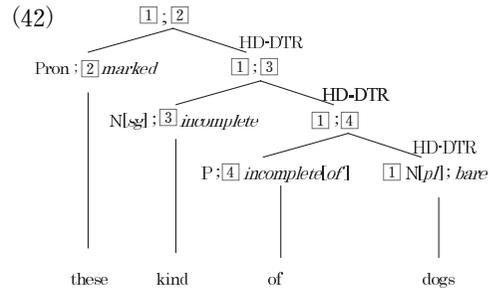
Now let us see how this approach might capture the facts that WG cannot account for. We will first consider *these dozen outcasts* in (34).



The noun *outcasts* is plural and bare. Since it is the head daughter, its HEAD value is shared by the dominating node. The

MARKING value is inherited from its non-head daughter *dozen*. As a singular countable noun, *dozen* is incomplete. The combination of *dozen* and *outcasts*, then, yields a nominal which is plural and incomplete. In order to be well-formed, it needs a determiner, and it should be compatible with a plural nominal. The demonstrative pronoun *these* is such a determiner. The resulting NP is marked and plural.

Let us next turn to *these kind of dogs* in (36), which is also problematic for WG.



The noun *dogs* is plural and bare. Since it is the head daughter, its HEAD value is shared by the dominating node. The MARKING value of the node is inherited from its non-head daughter *of*. Note that *of* is one of ‘minor prepositions’, which do not head a prepositional phrase (Van Eynde 2004). Rather, it is a kind of functor, and selects and combines with a head nominal. This preposition has the MARKING value *incomplete*, which in turn is associated with the feature FORM. We assume that the FORM value of this minor preposition is *of*, which is represented as *[of]* in the above figure. The nominal resulting from the combination *of* and *dogs* is plural and incomplete. Its plurality is shared by its mother node since it is a kind of information indicated as the HEAD

value. The MARKING value is inherited from its non-head daughter *kind*, which is a functor selecting a nominal head. We assume that *kind* selects an incomplete nominal whose FORM value is *of* so that it can combine with the nominal *of dogs*. As a singular countable noun, *kind* is incomplete. The combination of *kind* and *of dogs*, then, yields a nominal which is plural and incomplete. In order to be well-formed, it needs a determiner, and it should be compatible with a plural nominal. The demonstrative pronoun *these* is such a determiner. The resulting NP is marked and plural.

We have now provided a phrase-based analysis of English determiners, which can give a straightforward account of the facts that WG cannot capture.

4 Conclusion

In this paper, we have compared WG's dependency-based model with HPSG's phrase-based model, with reference to the determiners in English. At the outset of this paper, we discussed that there are significant differences between dependency structure and phrase structure, and we should choose between the two as a basis for representing syntactic structure. We noted two facts which might argue for dependency structure. Firstly, dependency structure is simpler and less redundant than phrase structure. Secondly, dependency structure can represent mutual dependency, and phrase structure cannot. It looks as if dependency should be a more satisfactory syntactic representation than phrase structure.

However, what emerges from the discussions in the rest of this paper is that WG's mutual dependency analysis contains some problems in dealing with some phenomena involving determiners. These are ascribed to the fact that WG does not have a way to dissociate the role of head from that of selector. For HPSG, it is not difficult to have such dissociation. Van Eynde's (2004, 2005) functor treatment of determiners is able to give a straightforward account of the relevant phenomena. The failure of mutual dependency and the success of the functor analysis seem to suggest that phrase structure, rather than dependency structure, should be adopted as the basis for syntactic representation (see also Maekawa 2007; Tallerman 2009).

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- of WG. See Hudson (2007).
- ² (8) is from Van Langendonck (1994 : 250).

Notes

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¹ Head is called 'parent' in the recent version

[Abstract]

Dependency Structure vs. Phrase Structure : Two Analyses of English Determiners

Takafumi MAEKAWA

Most syntactic theories have adopted phrase structure as the basis for sentence structure. In Word Grammar, however, all relationships are word-based, and phrases do not have any syntactic status. It has been widely believed that dependency structure and phrase structure are merely notational variants (Gaifman 1965 ; Robinson 1970). This paper argues that there are real differences between the two, and then compares the Word Grammar dependency model with one of phrase-based frameworks, Head-Driven Phrase Structure Grammar. The mutual dependency analysis in Word Grammar contains some problems in dealing with some phenomena involving determiners. Van Eynde's (2004, 2005) HPSG analysis is able to give a straightforward account of the relevant phenomena. This suggests that phrase structure, rather than dependency structure, should be adopted as the basis for syntactic representation.