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Studies in HPSG

Edited by
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Contents

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Preface

This volume of the Edinburgh Working Papers in Cognitive Science encompasses seven papers containing analyses of linguistic phenomena couched in the framework of Head-Driven Phrase Structure Grammar (HPSG). The papers cover a significant number of languages (Catalan, English, Greek, Korean, Polish, Turkish) and a wide range of syntactic, semantic, and pragmatic phenomena (parasitic gaps, relative clauses, case assignment, the structure of nominal and prepositional phrases, information structure, and honorification).

This volume is clearly intended to serve a very practical purpose: that of aiding the dissemination of research in HPSG. We are confident that putting together under one roof work by researchers in the Centre for Cognitive Science, the Human Communication Research Centre, and the Department of Linguistics at the University of Edinburgh will improve the accessibility of this research outside Edinburgh. But, in addition, it will hopefully increase mutual awareness between the different research groups as well.

However, we feel there is also a purely scholarly service to be performed by this volume. The diversity of languages and phenomena dealt with in the seven papers in this volume constitute an excellent testing ground for formal tools made available by HPSG. The achievement of wide empirical coverage is, on the one hand, a test that any theoretical framework must pass to show its explanatory power and, on the other hand, the means by which its cogs and wheels are regularly oiled and fine-tuned. The papers in this collection show that the mechanisms of HPSG can be successfully applied to a number of phenomena, while at the same time providing useful revisions and additions to the basic theoretical core. It is especially from this perspective that these seven papers make up a useful and coherent set.

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Information Packaging in HPSG

Elisabet Engdahl & Enric Vallduví

Abstract

This paper is concerned with how focus-ground should be optimally integrated into grammar. It proposes an analysis with the following characteristics: (1) information structure is an *integral part* of grammar since it interacts in principled ways with both syntax and phonology, (2) the representation of information structure in the grammar is *independent* of its particular structural realisation in different languages, and (3) there is an *analogous implementation* of the relationship between information structure and prosody in English-type languages and between information structure and the word-order dimension in Catalan-type languages. The framework utilised is HPSG. HPSG's multidimensional constraint-based architecture lends itself very well to expressing the mutual constraints on interpretation, syntax, and phonology that so diversely characterise focus-ground in different languages.

1   Introduction

There is increasing awareness of the large degree of crosslinguistic diversity involved in the structural realisation of information packaging (or information structure). For instance, while in English the informational focus-ground articulation is realised mostly through prosody, Catalan makes predominant use of word order to achieve the same. This paper is concerned with how information structure should be optimally integrated into grammar. It proposes an analysis with the following characteristics: (1) information structure is an *integral part* of grammar since it interacts in principled ways with both syntax and phonology, (2) the representation of information structure in the grammar is *independent* of its particular structural realisation in different languages, and (3) there is a *direct analogous implementation* of the relationship between information structure and prosody in English-type languages and between information structure and word-order in Catalan-type languages. The framework utilised is HPSG. HPSG's multidimensional constraint-based architecture lends itself very well to expressing the mutual constraints on interpretation, syntax, and phonology that so diversely characterise focus-ground in different languages. The study of information structure, we argue, is essential in addressing fundamental questions regarding grammar architecture.

Our point of departure is the assumption, expressed in e.g. Chafe (1976), Prince (1986), that what underlies the focus-ground distinction is a need to 'package' the information conveyed by a sentence so that hearers can easily identify which part of the sentence represents an actual contribution to their information state at the time of utterance, and which part represents material that is already subsumed by this information state. In particular, we adopt the proposal in Vallduví (1992), Vallduví (1994) that these 'ways of packaging' can be viewed as updating instructions or, equivalently, as types of transitions between information states.

The paper is structured as follows. Section 2 provides a brief overview of information packaging. Section 3 discusses the strategies that two language types, as represented by English and Catalan, exploit for realising information packaging. Section 4 outlines a way of representing information structure using the *sign-based* formalism of HPSG and looks at how language-specific generalisations can be expressed in this framework. Section 5 compares the proposal presented here with two alternative approaches. Finally, in Section 6 we discuss some issues regarding the connection between information packaging and other semantic aspects.

2   Information packaging

Information packaging (a.k.a. communicative dimension, psychological structure) is a structuring of sentences by syntactic, prosodic, or morphological means that arises from the need to meet the communicative demands of a particular context.[1] In particular, information packaging indicates how linguistically conveyed information fits into the hearer's information state at the time of utterance. When communicating a proposition ϕ, speakers may realise it by means of different sentential structures according to their beliefs about the hearer's knowledge

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[1] There is a long pragmatic tradition that has looked in detail at how the form of an utterance varies as a function of the contribution the utterance makes to the discourse. See, for example, von der Gabelentz (1868), Bolinger (1954), Firbas (1964), Halliday (1967), Halliday (1985), Kuno (1972), Gundel (1974), Gundel (1988), Clark and Haviland (1977), Sgall and Hajičová (1977), Sgall and Hajičová (1978), Givón (1983), Prince (1986), Ward (1988).

and attentional state with respect to ϕ. The term 'packaging' is due to Chafe (1976):

> I have been using the term *packaging* to refer to the kind of phenomena at issue here, with the idea that they have to do primarily with how the message is sent and only secondarily with the message itself, just as the packaging of toothpaste can affect sales in partial independence of the quality of the toothpaste inside. (Chafe 1976:28)

As a first illustration of how information packaging affects natural language interpretation, consider (1):

(1)   a. He hates CHOCOLATE.
      b. He HATES chocolate.
      c. Chocolate he LOVES.

In (1), (a) and (b) are truth-conditionally equivalent. They differ not in what they say about the world, but in how they say what they say about the world, i.e., they differ in the way their content is packaged. Compare now (b) and (c): they differ in their truth conditions, but exude a certain interpretive equivalence, which is a result of the fact that they are packaged in the same way. In other words, (b) and (c) differ in what they say about the world, but not in how they say it. In every language there is an array of sentences which, like (1a) and (1b), differ only in the way they are packaged. However, these alternatives cannot be used interchangeably in context. This can be empirically confirmed in terms of discourse felicity. For instance, while (1a) is a felicitous answer to the question *What does he hate?*, (1b) is not.

The partition of sentences into a focus-ground structure (also known as focus-topic, rheme-theme, new-given) plays a central role in information packaging (see Sgall and Hajičová 1977, Sgall and Hajičová 1978, Halliday 1985, Prince 1986, Ward 1988, *inter alia*). There is a wealth of characterisations of focus-ground, but they all share one characteristic: focus-ground divides the sentence into a part that anchors the sentence to the previous discourse or the hearer's 'mental world' and an informative part that makes some contribution to the discourse or the hearer's 'mental world'. As suggested by Clark & Haviland (1977:5), the point of such a partition is to optimise the communicative process. Vallduví (1992), Vallduví (1994) contains a partial formalisation of information packaging which builds on these traditional informational primitives of focus-ground with the aim of establishing a first step towards an implementation in a dialogue-modeling system. The different packagings illustrated in (1) are viewed as different *instructions* for information update. The sentences in (1) have the same propositional content but encode different instruction-types. From a dynamic perspective, these instruction-types can be viewed as transition-types from an input information state to an output information state or as different ways of effecting information update. Each instruction-type—there are four of them—corresponds to a different focus-ground partition.

The *focus* is defined as the actual information or update potential of a sentence S, i.e. the only contribution that (according to the speaker) S makes to the information state of the hearer at the time of utterance. All sentences have a focal segment. The *ground*, in contrast, is already subsumed by the input information state and acts as an usher for the focus: it guarantees the appropriate attachment or anchoring of the information in the hearer's information state. Sentences have a ground only if the context warrants its use, i.e. if the ushering is (thought

by the speaker to be) required. The ground is further divided into *link* and *tail*. Link and tail each contribute in their own way to the ushering role of the ground. Links establish a particular locus of update in the input information state, while the presence of the tail indicates that a nondefault mode of update is (in the speaker's eyes) required at that point in discourse. The four instruction-types are the result of different combinations of focus, link, and tail.

In order to understand how instructions work, let us view information states as file-like constructs (see Heim 1983). Files are collections of file cards. File cards correspond to what are called discourse referents, entities, or markers in other frameworks. Each file card has a number of records—analogous to conditions in Discourse Representation Theory (Kamp and Reyle 1993)—written on it listing descriptions (attributes and relations) that concern the entity it denotes. Given this background, the ushering function of the ground is described as follows. The link of a sentence S, on the one hand, establishes a particular file card as the locus of update. This means that the information conveyed by the focus of S is to be recorded on the file card denoted by the link (cf. Kuno's (1972) 'sort key', Chafe's (1976) 'frame', and Reinhart's (1982) 'address'). We can express this by saying that, if an expression denoting a file card *fc* is structurally encoded, via the language-specific means of realising information structure, as a link, then it is informationally interpreted as GOTO(*fc*). As noted, the role of a link is to *establish* a locus of update. Therefore, if the locus of information update for S_n is inherited from S_{n-1}, no link is required for S_n and we obtain a linkless instruction. The tail, on the other hand, points at a particular (possibly underspecified) record on *fc*. If a tail is present, the information conveyed by the focus is taken to modify or complete the record designated by the tail. Tailless instructions correspond to a default mode of update (UPDATE-ADD), where the update potential of S is merely added to *fc* in the input file as a record. The presence of the tail indicates that a nondefault mode of update (UPDATE-REPLACE), involving a different type of ushering, is (in the speaker's eyes) required.[2]

The four instruction-types reflect the combination of the two modes of update with the establishment of a locus of update or the absence of such establishment:

(2) link-focus $\longmapsto$ GOTO(*fc*)(UPDATE-ADD(*information*))
     link-focus-tail $\longmapsto$ GOTO(*fc*)(UPDATE-REPLACE(*information*,record(*fc*)))
     all-focus $\longmapsto$ UPDATE-ADD(*information*)
     focus-tail $\longmapsto$ UPDATE-REPLACE(*information*,record(*fc*))

The link-focus instruction designates a locus of update in the hearer's information state and indicates that the update is to be carried out by adding a record on this locus of update with the information conveyed by the focus. The link-focus-tail instruction designates a locus of update too, but in addition it designates a particular record on the file card that acts as locus of update and indicates that the update is to be carried out by completing or modifying this record with the information conveyed by the focus. The two linkless instructions parallel these two types, except that the absence of a link here means that the locus of update is inherited. These four instruction-types encompass systematically all the informational constructions

[2]The file metaphor and the idea of a designated file card is also used by Erteschik-Shir, to appear. Her idea of a designated file card, however, is distinct from, although not totally unrelated to, our use of designated file card as loci of update and is closer to the notion of 'topic' in Givón (1983) or the idea of 'focus' (unrelated sense) in Sidner (1983). Erteschik-Shir's comprehensive proposal covers aspects of informational focus in its relation to syntax, prosody, and semantics.

previously described in the literature from the topic-comment, ground-focus, and other perspectives. UPDATE-REPLACE instructions correspond to the so-called narrow-focus sentences or to a typical open-proposition structure in Prince (1986). Link-focus instructions correspond to the typical topic-comment structure or to a standard categorical judgment (Kuroda 1972). Finally, a subset of the all-focus instructions corresponds to the neutral descriptions of Kuno (1972), the news sentences of Schmerling (1976), or to a thetic judgment.

It follows from the way the informational primitives are defined that the focus-ground partition of a monoclausal sentence is composed of discrete units that do not overlap. In addition, every nonweak phrase *must* be associated with a focus, link, or tail interpretation.[3] This follows from the assumptions that in every sentence there is a focal segment and that sentences do not have a ground component unless the context requires its use: if a nonweak constituent is not ground, it must be focal, and if it is not focal it must be ground.

Let us illustrate the use of these instructions with a concrete English example. Consider (3) and (4). S_0 is a presidential aid, H_1 a newly-appointed White House butler, and H_2 the Foreign Secretary after returning from a trip to Europe. In these examples and below, foci are delimited by square brackets, small caps represent a focus-associated A-accent (nuclear stress), and boldface indicates the link-associated B-accent of English. The terms A accent and B-accent are taken from Jackendoff (1972). In Pierrehumbert's (1980) phonology of intonation, A-accents correspond to a simplex high pitch accent (H*), generally followed by a falling boundary tone. Jackendoff's B-accent corresponds to a complex fall-rise pitch accent (L+H*). We will return to the facts concerning realisation in Section 3:[4]

(3)   a. H_1: So tell me about the people in the White House. Anything I should know?

    b. S_0: Yes. The **president** [F hates the Delft CHINA SET]. Don't use it.

(4)   a. H_2: In the Netherlands I got a big Delft china tray that matches the set in the living room. Was that a good idea?

    b. S_0: Maybe. The **president** [F HATES] the Delft china set. (but the **first lady** LIKES it.)

The update potential of (3b) and (4b) is *not* the same. This is because the H_1's input information state (let us call an input information state a file F_1) in the scenario of (3) differs from H_2's F_1 in the scenario of (4). From both contexts it can be inferred that both H_1 and H_2 know about the people in the White House including the president, the Delft china set, and about the president owning the latter. However, in (3) S_0, the presidential aid, has no reason to assume that the hearer, H_1, has any beliefs about (and is attending to) the president's attitude towards the Delft china set. H_1's question, *Anything I should know?*, could have been given a number of equally relevant, felicitous answers: that the president does not like fish, that the president always eats at nine o'clock, that he has high cholesterol, that he eats in the Oval Office, and so on. In contrast, in (4) S_0 is warranted to assume, given what she has heard in the

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[3] The description 'nonweak phrase' is meant to exclude weak proforms. Weak proforms (null pronouns and pronominal clitics in Catalan and unstressed pronouns in English, among other forms) do not participate in the construction of instructions (see Vallduví (1992) for arguments in favour of this position). Strong proforms are nonweak.

[4] In the following examples, both *china* and *set* have been written in small caps, because there is interspeaker variability in the assignment of stress to the phrase *china set*. Some speakers treat it as a compound and, therefore, stress *china*. Others do not and stress *set*.

immediately previous dialogue, that H_2 believes (and is attending to) that the president has some attitude towards the Delft china set (perhaps without knowing which one it is). Using Jackendoff's (1972) words, the president's having some attitude towards the Delft china set is 'under discussion' at the time of utterance in context (4) but not in context (3). This means that $F_1(H_1)$ at the time (3b) is uttered contains less information than $F_1(H_2)$ at the time (4b) is uttered. The difference in informativeness or update potential between (3b) and (4b) is determined by the contents of the input files that they can felicitously augment. Nevertheless, both (3b) and (4b) express the same propositional content, namely that the president hates the Delft china set. The truth-conditional identity of these sentences is reflected in the fact that they yield the same output information state. The output information state (F_2) for H_1 and H_2 is exactly the same. Both $F_2(H_1)$ and $F_2(H_2)$ contain the information that the predident hates the Delft china set. Differences in update potential between sentences that differ only in the scope of their focal segments are, therefore, due to the fact that they can felicitously update different information states.

The difference in update potential between (3b) and (4b) is reflected in their structure. In (4b), for instance, where the president's having some attitude towards the Delft china set is treated as being believed and attended to by the hearer, a structure is chosen that singles out the verb *hates* as the only informative part of the sentence, while *the Delft china set* is treated as part of the ground. In (3b), where no such assumption is warranted, another structure is used that indicates that the entire verb phrase is focal. As discussed below, example (3b) encodes a link-focus instruction and example (3a) encodes a link-focus-tail instruction. In the case of (3b) and (4b), the structures utilised to realise the difference between the UPDATE-ADD instruction and the UPDATE-REPLACE instruction are intonational structures. In addition, both (3b) and (4b) indicate that *the president* is a link, i.e. they establish the file card for the president as the locus of update. In English, this function is also carried out intonationally. The exact nature of these intonational realisations is discussed in Section 3.

3   Linguistic realisation

The characterisation of informational primitive and instruction-type outlined in Section 2 is independent of how a particular instruction-type is realised in particular languages. In fact, the structural realisation of these instruction-types differs from language to language. All structural dimensions—intonation, syntactic precedence, and morphological marking—are susceptible to exploitation by information structure.

Let us look at how English and Catalan realise the three informational primitives (focus, link, and tail) and the instruction-types they combine into. Compare the English realisations discussed in (3) and (4), repeated in (5), with their Catalan analogues in (6). The (a) sentences are link-focus instructions, while the (b) sentences are link-focus-tail instructions:

(5)   a.   The **president** [$_F$ hates the Delft CHINA SET.]

      b.   The **president** [$_F$ HATES] [$_{TAIL}$ the Delft china set.]

(6)   a.   El president$_1$ [$_F$ odia el joc de porcellana de DELFT t$_1$.]

      b.   El president$_1$ [$_F$ l$_2$'ODIA t$_2$ t$_1$,] [$_{TAIL}$ el joc de porcellana de Delft$_2$.]

We observe two differences. One, we see that there is no syntactic contrast between the two English sentences. The only contrast is intonational: in the link-focus sentence nuclear stress (the A-accent) appears on the right-hand periphery of the clause, whereas in the link-focus-tail sentence it appear sentence-medially, entailing the deaccenting of the tail *the Delft china set*. In Catalan, however, a syntactic opposition exists: in the link-focus sentence, the focal object appears in its canonical position within the sentential core, whereas in the link-focus-tail sentence, the tail object appears in a peripheral detachment slot (this dependency is indicated by the coindexing of the detached object and the canonical position *t* in (6)).[5] At first blush, there appears to be an intonational contrast as well, but on closer inspection it becomes clear that nuclear stress is assigned to the same position—the right-hand boundary of the sentential core—in both sentences. The second difference between English and Catalan has to do with the realisation of links. In the English sentences the link phrase *the president* appears in boldface, which indicates that it is associated with a B-accent. In Catalan, in contrast, there is no B-accent associated with the link phrase. Rather, the link appears in a peripheral detachment position as well.[6]

English and Catalan vary in their structural realisation of information packaging along two important lines: whether the language has a malleable intonational structure—intonational plasticity (Vallduví 1991)—and whether the focus-ground structure affects the constituent order. This pattern is summarised in Table 1:

	English	Catalan
Intonation	plastic A- & B-accents	nonplastic A-accent
String Order	links optionally front	ground in detachment slots

Table 1: Structural resources for realisation of information packaging

The conclusion derived from the comparison of (5) and (6) is that, when it comes to realising information packaging, where English uses intonational strategies, Catalan uses syntatic strategies. English has a malleable intonation. This contrasts with the nonplasticity of Catalan. In Catalan nuclear stress necessarily falls on the right-hand boundary of the sentential core. It cannot be 'shifted' to the left. In addition, English uses a richer repertoire of accents than Catalan, since it exploits both A- and B-accents. The A-accent is exploited by both languages and is associated with a focal interpretation, but the B-accent is exploited in English to realise links. The contour formed by a B-accent followed by an A-accent seen in the

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[5] There are a number of diagnostics used to determine the peripheral status of the object. The clearest one is the presence of a clitic bound by the detached complement. Cooccurrence of clitic and complement within the sentential core is illicit, but a clitic must be present if the complement it stands for is outside the sentential core (or not present at all). Other diagnostics involve string order and placement of particles. Some variants of Catalan allow for detachment configurations (indefinites, partitives, locatives), where no clitic appears, thus resembling Spanish. In the standard variant described here, clitics are obligatory for all complements.

[6] Since Catalan lacks subject clitics, the clitic diagnostic cannot be used for the subject *el president* 'the president'. However, the other diagnostics agree with the detachment analysis. In addition, it has been convincingly argued on independent grounds that Catalan is a VOS language and that subject links in examples like (6a) and (6b) appear in a left-hand position (see Rosselló 1986, Rigau 1988, Bonet 1990, Solà 1992, and Vallduví 1993).

link-focus structure in (5a) is called the 'suspension bridge contour' by Bolinger (1961) and the 'hat pattern' by Cohen and 't Hart (1967). Catalan does not possess a B-accent. Links display no particular intonational prominence. Instead, what identifies them is that they are obligatorily left-detached. Precisely, Catalan is characterised by the necessary placement of nonfocal phrases in right- or left-detachment slots: links, as just noted, are left-detached and tails, as illustrated in (6), are right-detached. The sentential core may contain only focal phrases. Phrases (arguments or adjuncts) which, due to default string order, would otherwise appear in the rightmost position, must be removed from that position if association with an A-accent is inappropriate, namely, if they are nonfocal. Left-hand placement of the link (a.k.a. 'topicalisation') is also available, albeit optional, in English. However, its application on a given phrase does not preempt it being B-accented, which shows B-accenting is the necessary correlate of linkhood (as an exception, subject links may in some cases appear without any intonational marking; nonsubject links, whether fronted or in situ, must be B-accented).[7]

The description of the English intonational facts that we have just offered, qua structural correlates of information packaging, is an idealised picture which focuses on those aspects of intonation in English that correlate most directly with the focus-ground articulation. The use of intonation to express other pragmatic, semantic or metalinguistic aspects of interpretation may override the default prosodic realisation of foci and links. See, for instance, the L*+H accent associated with speaker uncertainty (Ward and Hirschberg 1985), the uses of intonation to express illocutionary distinctions (Pierrehumbert and Hirschberg 1990), the (de)accenting phenomena that affect the assignment of pitch accent at the phrasal and word-internal level within both focus and link (Ladd 1980, Ladd 1983, van Deemter 1994, Vallduví and Zacharski 1994), and the 'super-utterance prosodic assignments' due to conversational context or nature of the exchange within which a sentence is uttered (Kowtko *et al.* 1992, Kowtko 1992). Finally, it is perhaps more appropriate to speak about focus- and link-associated tunes rather than focus- and link-associated pitch accents (Ladd 1991, Steedman 1991).

In sum, informational primitives are correlated with different structural realisations in Catalan-type and English-type languages. In the former the structural correlates are syntactic, involving both dominance (detachment) and precedence (left- versus right-detachment). In the latter the structural correlates are intonational, involving two types of accent.[8]

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[7] In English, there are other 'marked' syntactic constructions, e.g. *it*-clefts, *wh*-clefts, that are also used to express informational partitions. However, as argued by Delin (1992), Delin (1995) clefting serves other functions as well, such as the marking of presupposition (the kind that displays constancy under negation). Vallduví (1992) argues that this is the primary function of clefting and that its information-packaging value is secondary.

[8] There is an important language-type which is not represented in Table 1 at all: languages that make use of morphemes to realise information packaging. In languages like Navajo (Schauber 1978) and Vute (Thwing and Watters 1987), for instance, foci are associated with a particular morpheme, and Japanese *wa* (e.g. Kuno 1972) can be straightforwardly chracterised as a marker of linkhood. Finally, there are languages like Spanish—and some variants of Catalan that resemble Spanish in this respect—which can use both syntactic or prosodic strategies. Thus, in Spanish the analogues of both (5b) and (6b) are grammatical. What the exact account of such optionality should be will be left as an open question.

4   An HPSG analysis

When learning a language, we learn to generate and comprehend sentences with particular information structures. Learning the particular strategies a given language uses to realise information packaging is an integral part of learning this language. Hence, information structure and its structural realisation need to be integrated into grammar. This paper carries out this integration in a constraint-based grammar. The interaction of information structure with syntax and prosody in English and Catalan is illustrated using HPSG. The mutual constraints between dimensions available at every level in HPSG prove to be very useful in accounting for the realisation of information packaging in these languages in an elegant way.[9]

In HPSG the relevant units of linguistic information are *signs* (Pollard and Sag 1987, Pollard and Sag 1994). They express phonological, syntactic, semantic and pragmatic information in an explicit fashion. Signs are formalised as typed feature structures. Each feature is an attribute-value pair which allows for recursion. *Lexical signs* contain the basic information about a word. One core idea in sign-based frameworks is that all relevant linguistic dimensions are represented in every linguistic unit, i.e. in words, phrases, clauses and sentences. The sign in (7) is the lexical sign for *walks* (cf. Pollard & Sag 1994:28):

$$
(7) \quad
\begin{bmatrix}
\text{PHON: } \langle \text{ walks } \rangle \\[4pt]
\text{SYNSEM: }
\begin{bmatrix}
\text{LOCAL: }
\begin{bmatrix}
\text{CATEGORY: }
\begin{bmatrix}
\text{HEAD: } \text{verb[fin]} \\
\text{SUBCAT: } \langle \text{ NP[nom]}\boxed{1}_{[3rd,sing]} \rangle
\end{bmatrix} \\[10pt]
\text{CONTENT : }
\begin{bmatrix}
\text{REL} \quad : \text{ walk} \\
\text{WALKER: } \boxed{1}
\end{bmatrix} \\[8pt]
\text{CONTEXT : } [\text{BACKGROUND: } [\quad]]
\end{bmatrix}
\end{bmatrix}
\end{bmatrix}_{word}
$$
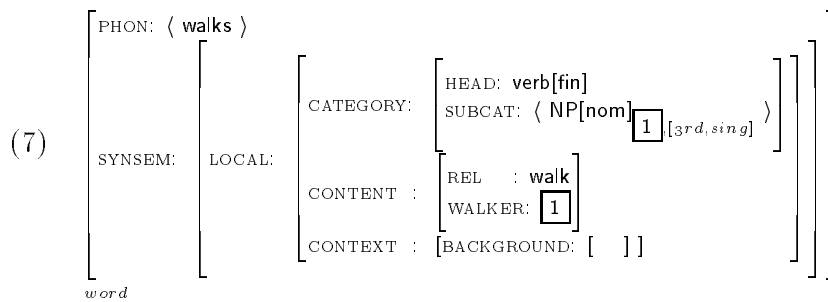
The value of PHON in Pollard and Sag (1994) is simply an orthographic representation of the corresponding lexical item, e.g. walks.[10] The feature CATEGORY provides information about the inherent and combinatorial properties of a word. The CONTENT feature contains information about aspects of semantic interpretation which are assumed to be context-independent. Finally, CONTEXT provides information relating to the pragmatic context of utterance. Feature structures allow many ways of organising different kinds of linguistic information and of describing the way this information interacts. A useful tool to express such interactions is *structure sharing* between relevant parts of a sign. In (7) there is structure sharing between the value in the SUBCAT feature in CATEGORY and the argument of WALKER in CONTENT. Structure sharing is indicated by the identity of the boxed tags.

In addition to lexical signs, there are *phrasal signs*. They result from combining signs according to immediate dominance (ID) schemata. They have a *daughters* feature, DTRS, which

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[9]Several proposals exist that explore the integration of focus-ground into an explicit syntax in a choice of frameworks: Culicover and Rochemont (1983), Rochemont (1986), Oehrle (1991), Steedman (1991), Erteschik-Shir (1993). Phonologists have also addressed the issue of how intonational structure signals focus-ground articulation (e.g. Gussenhoven 1983, Ladd 1983, Selkirk 1984, von Stechow and Uhmann 1986, Bird 1991).

[10]There is important recent work on the expression of phonological information in typed feature structures (see Bird 1992, Bird 1995, Bird and Klein 1994). The PHON field is enriched to contain multi-tiered, hierarchical representations.

represents the immediate constituent structure of the phrase (cf. Pollard & Sag 1994:32):

$$
(8) \quad
\begin{bmatrix}
\text{PHON} \quad : \langle \text{ she, walks } \rangle \\
\text{SYNSEM: S[fin]} \\[1em]
\text{DTRS} \quad :
\begin{bmatrix}
\text{HEAD-DTRS:}
\begin{bmatrix}
\text{PHON} \quad : \langle \text{ walks } \rangle \\
\text{SYNSEM: VP[fin]}
\end{bmatrix} \\[1.5em]
\text{COMP-DTRS:} \; \langle
\begin{bmatrix}
\text{PHON} \quad : \langle \text{ she } \rangle \\
\text{SYNSEM: NP[nom]}
\end{bmatrix}
\; \rangle
\end{bmatrix} \\[2em]
phrase
\end{bmatrix}
$$

In Pollard & Sag (1994:402) the phrasal signs for verb phrases and sentences are licensed by two ID schemata called Head-Complement Schema and Head-Subject Schema, respectively. These schemata specify that these signs must have a head daughter and a variable number of complement daughters:

(9)   *Head-Complement Schema*
   The SYNSEM|LOCAL|CATEGORY|SUBCAT value is a list of length one, and the DTRS value is an object of sort *head-comp-struc* whose HEAD-DTR value is a word.

(10)   *Head-Subject Schema:*
   The SYNSEM|LOCAL|CATEGORY|SUBCAT value is <>, and the DTRS value is an object of sort *head-comp-struc* whose HEAD-DTR value is a phrase..., and whose COMP-DTRS value is a list of length one.

The head/complement distinction will be used in capturing the facts concerning instantiation of information structure in English. In addition, we need some way of expressing the constraints on the linear order of constituents. These are expressed through linear precedence (LP) statements. Precedence follows the obliqueness hierarchy of complements (among complements, the most oblique argument is the rightmost one). Phrasal signs can also be represented in tree notation. The tree in (11) is equivalent to feature structure (8):

(11)

```
                    S[fin]
              C  /         \  H
          NP[nom]            VP[fin]
             |                  |
            she               walks
```
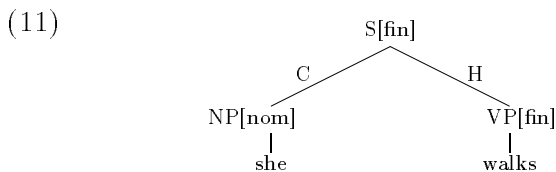
DTRS information appears at the end of the labelled arcs. These arcs are labelled H for head daughter and C for complement daughter. The PHON values for each lexical sign are written at the leaf below each daughter node. The rest of the information appears in the node labels.

Where should information structure be located in such multidimensional representations? Karttunen and Kay (1985), for instance, use a feature NEW in the syntactic category of a phrase. Bird (1991) uses a FOC feature in CONTENT. However, the crosslinguistic facts discussed above advise against inherently associating information-structure with only syntax or only phonology. Rather, they favour an independent representation of information-packaging information within the CONTENT or CONTEXT features. Given the view of information packaging adopted here, it seems most natural to represent information-structure information

within CONTEXT. We will enrich CONTEXT with a feature INFO-STRUCT as shown in (12), corresponding directly to the informational primitives introduced in Section 2:

$$(12) \quad \left[\text{CONTEXT:} \left[\begin{array}{l} \text{C-INDICES: } [\quad] \\ \text{BACKGROUND: } [\quad] \\ \text{INFO-STRUCT:} \left[\begin{array}{l} \text{FOCUS:} \\ \text{GROUND:} \left[\begin{array}{l} \text{LINK:} \\ \text{TAIL:} \end{array} \right] \end{array} \right] \end{array} \right] \right]$$

The values of FOCUS and GROUND are instantiated, through structure sharing, with the constituents that realise the focus and the ground of the instruction, respectively. Thus, FOCUS, LINK, and TAIL take feature structures as values. The way the instantiation of these values comes about depends on the strategies found in the individual languages. Let us look first at how pitch accent type and informational status constrain each other in English and how this interacts with word order in so-called focus projection. We then will turn to the use of detachment in Catalan.

4.1 English

Let us assume that the PHON field contains a feature ACCENT whose values are the A- and B-accents discussed above. These values are instantiated through the principles illustrated in (13a) and (13b):

$$(13) \quad \text{(a)} \; \boxed{1} \left[\begin{array}{l} \text{PHON|ACCENT: A} \\ \text{INFO-STRUCT|FOCUS: } \boxed{1} \end{array} \right]_{word} \qquad \text{(b)} \; \boxed{1} \left[\begin{array}{l} \text{PHON|ACCENT: B} \\ \text{INFO-STRUCT|GROUND|LINK: } \boxed{1} \end{array} \right]_{word}$$

The structure in (13a) is a skeletal lexical sign which says about itself that it contributes focal information.[11] In a similar way, (13b) introduces a word with accent B that will be interpreted as a link. The pitch accent type and the value of INFO-STRUCT constrain each other. This is expressed by means of structure sharing between INFO-STRUCT and the sign itself. Presence of an A or B-accent, then, is sufficient to identify positively the informational contribution of a lexical sign as focal or link. And vice versa, the focal or link status of a lexical sign is sufficient to determine the value of its ACCENT. The principles in (13) express only a mutual constraint between ACCENT and INFO-STRUCT. Ultimately, what determines what the values of these features are is (the speaker's view) of the hearer's information state at the time of utterance.

Not all lexical items in a sentence, however, are associated with one of these accent types. Therefore, we need a third type of lexical sign as in (14):

---

[11] In the present formulation, INFO-STRUCT takes feature structures of sort CONST-STRUC containing syntactic, phonological, and semantic information. It would be more appropriate to say that the value of INFO-STRUCT is just structure-shared with the CONTENT information. This is the line that we are currently pursuing in collaboration with the DYANA-2 integrated implementation initiative (see Beaver 1995, Grover and Hitzeman 1995).

$$(14) \quad \begin{bmatrix} \text{PHON}|\text{ACCENT: } \mathsf{u} \\ \\ \text{INFO-STRUCT: } [\quad] \end{bmatrix}_{word}$$

In this sign the value of the ACCENT feature is u (for 'unmarked'). When ACCENT has this value, the value of the INFO-STRUCT feature is not specified. The informational contribution of this item can only be determined as it combines with other signs.[12]

As noted above, phrasal signs are licensed by the relevant ID schema. We propose that, in addition, phrasal signs in English must satisfy the INFO-STRUCT instantiation constraints given in (15). These two constraints capture, respectively, the inheritance and projection of INFO-STRUCT values in English:[13]

(15) INFO-STRUCT *instantiation principles for English:*
  Either (i) if a DAUGHTER's INFO-STRUCT is instantiated, then the mother inherits this instantiation (*for narrow foci, links and tails*),
  or (ii) if the most oblique DAUGHTER's FOCUS is instantiated, then the FOCUS of the mother is the sign itself (*wide focus*).

To see how the value of INFO-STRUCT in phrasal signs follows from these principles, consider the two interpretations of (16). This sentence, with an A-accent on the object, can be interpreted either with narrow focus on the object noun phrase or with wide focus on the whole verb phrase (we assume a context such that in both cases *the president* is interpreted as link):

(16) The **president** [F hates [F the Delft CHINA SET.]]

Some contexts require string (16) to have a narrow-focus reading. The narrow focus reading is licensed by (15i) (focus inheritance), while the wide focus reading is licensed by (15ii) (focus projection).[14] The sign for the narrow focus case is in (17) (irrelevant aspects omitted):

---

[12] The precise way in which unspecified information is represented will not be addressed. An option is to use disjunctive values. See Manandhar (1994a) for an alternative proposal involving a hierarchy of values. A fully worked out description of intonation would, of course, have to work on real tones (rather than the mnemonic categories A and B that we use here) and worry about how tunes and intonational phrases are composed (see Bird 1991, Taglicht 1994). The notation we use, while phonologically inadequate, is sufficient to express the multidimensional constraints we are concerned with here.

[13] These principles should of course be stated declaratively along the lines of the Subcategorisation Principle in Pollard and Sag (1994). We have here given a simpler, more readable, version.

[14] The application of inheritance or projection is, of course, ultimately determined by the context at the time of utterance. The INFO-STRUCT instantiation principles are just the grammatical mechanism that allows the same string to have one meaning or the other in different contexts.

(17)   *Object NP focus:*

$$
\begin{array}{c}
\text{S[fin]}\\[4pt]
\left[\text{INFO-STRUCT:}\ \begin{bmatrix}\text{FOCUS}\ :\ \boxed{1}\\[6pt]\text{GROUND:}\ \begin{bmatrix}\text{LINK:}\ \boxed{4}\\\text{TAIL:}\ \boxed{2}\end{bmatrix}\end{bmatrix}\right]
\end{array}
$$

C   H

$$
\begin{array}{c}
\boxed{4}\\
\text{NP[nom]}\\[4pt]
\begin{bmatrix}\text{PHON}|\text{ACCENT: B}\\\text{INFO-STRUCT}|\text{GROUND}|\text{LINK:}\ \boxed{4}\end{bmatrix}
\end{array}
\qquad
\begin{array}{c}
\boxed{3}\\
\text{VP[fin]}\\[4pt]
\left[\text{INFO-STRUCT:}\ \begin{bmatrix}\text{FOCUS}\ :\ \boxed{1}\\\text{GROUND}|\text{TAIL:}\ \boxed{2}\end{bmatrix}\right]
\end{array}
$$

the **president**

H   C

$$
\begin{array}{c}
\boxed{2}\\
\text{V[fin]}\\[4pt]
\begin{bmatrix}\text{PHON}|\text{ACCENT: u}\\\text{INFO-STRUCT:}\end{bmatrix}
\end{array}
\qquad
\begin{array}{c}
\boxed{1}\\
\text{NP[acc]}\\[4pt]
\begin{bmatrix}\text{PHON}|\text{ACCENT: A}\\\text{INFO-STRUCT}|\text{FOCUS:}\ \boxed{1}\end{bmatrix}
\end{array}
$$

hates   the Delft CHINA SET

The B-accent on the subject *the president* and the A-accent on the object *the Delft china set* uniquely determine their informational status. Therefore, through (13), their signs structure-share with the values of the LINK and FOCUS features, respectively. In the tree notation, the value of e.g. LINK in (17) is token-identical to the value of COMP-DTR, which appears at the end of the arc labelled C. In contrast, the unaccented verb *hates* does not by itself restrict its potential contribution. The value of its INFO-STRUCT remains uninstantiated (see (14)).

INFO-STRUCT in the VP[fin] sign must contain the information that the object is focal. This information is made available at the VP[fin] level through (15i): VP[fin] inherits the value of its INFO-STRUCT from its complement daughter. Once the INFO-STRUCT|FOCUS value of the VP[fin] sign is determined, the unaccented head daughter *hates* must be interpreted as instantiating the value of the mother's GROUND|TAIL (since, as noted, every element in the sentence *must* contribute to information structure). The values of INFO-STRUCT in S[fin] are also obtained via inheritance. The mother sign inherits the INFO-STRUCT instantiations from all its daughters by (15i): the object is the focus, the verb is a tail, and the subject is a link.

In some other contexts, string (16) will be required to have a wide-focus reading. The structure for the wide focus reading is given in (18). It is identical to (17) except for the instantiation of the FOCUS value in the VP[fin] and S[fin] signs. Here, projection as in (15ii) may apply, since the most oblique daughter's FOCUS is instantiated. Therefore, the FOCUS value of the mother is the sign itself. At the S[fin] level, projection cannot apply anymore. S[fin] obtains its INFO-STRUCT values through inheritance as in (18):

(18)   *VP focus:*

S[fin]

$$\left[\text{INFO-STRUCT:} \left[\begin{array}{ll}\text{FOCUS} & : \boxed{3} \\ \text{GROUND|LINK:} & \boxed{4}\end{array}\right]\right]$$

C ——————— H

$$\boxed{4}$$
NP[nom]

$$\left[\begin{array}{l}\text{PHON|ACCENT: B} \\ \text{INFO-STRUCT|GROUND|LINK:} \boxed{4}\end{array}\right]$$

the **president**

$$\boxed{3}$$
VP[fin]

$$\left[\text{INFO-STRUCT|FOCUS:} \boxed{3}\right]$$

H ——————— C

$$\boxed{2}$$
V[fin]

$$\left[\begin{array}{l}\text{PHON|ACCENT: u} \\ \text{INFO-STRUCT:}\end{array}\right]$$

hates

$$\boxed{1}$$
NP[acc]

$$\left[\begin{array}{l}\text{PHON|ACCENT: A} \\ \text{INFO-STRUCT|FOCUS:} \boxed{1}\end{array}\right]$$

the Delft CHINA SET
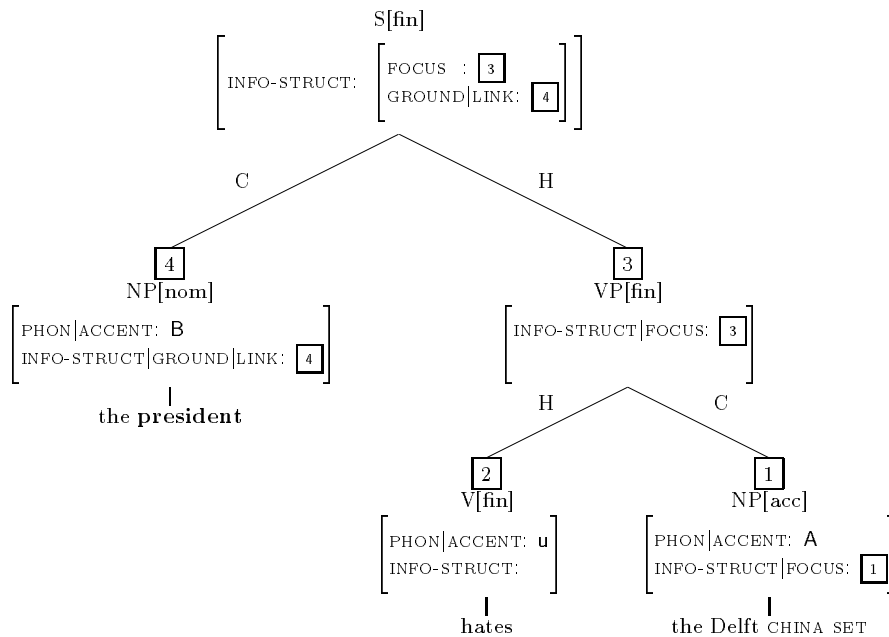
As has been well known since Bresnan (1971), focus projection is only possible if the A-accented item is the peripheral one. In (15ii) this is captured by explicitly stating that the complement daughter whose FOCUS value is instantiated has to be the most oblique one. Principle (15ii) correctly allows a wide-focus reading in (19a), while ruling it out in (19b). Our grammar must disallow projection here, since (19b) is not felicitous in any context. The instantiation of the FOCUS value of *the president* in a string like (19b) allows only for inheritance, which is the narrow-focus reading in (19c):

(19)   a.   The butler [F offered the president some COFFEE.]
       b.   * The butler [F offered the PRESIDENT some coffee.]
       c.   The butler offered [F the PRESIDENT] some coffee.

The principles in (15) also account for the structural ambiguity of a certain class of strings where the subject is associated with an A-accent. They allow for a reading with a narrow-focused subject and an all-focus reading (so-called thetic reading):

(20)   [F [F The PRESIDENT] called.]

Focus projection, i.e. the all-focus interpretation, is correctly licensed. Principle (15ii) may apply because the subject is the only complement daughter of S[fin] and, hence, the most oblique one.[15] Principle (15ii) refers to the head/complement status of the daughter whose

---

[15] As it stands, (15ii) incorrectly predicts that (i) should have an all-focus reading:

(i)   [F The PRESIDENT hates the Delft china set.]

We believe the unavailability of the reading in (i) is due to independent reasons pertaining to the domain of prosodic organisation. The wide-focus reading in cases of A-accented subjects like (20) is only available if the predicate is prosodically 'weak'. If the sentence has a heavy predicate (full object NP, complex predicate, etc.) an additional pitch accent on the predicate is required (cf. Gussenhoven 1983 for discussion).

FOCUS value is instantiated. This is necessary to rule out focus projection in cases like (21) in which the A-accent is associated with the verb rather than a complement. The structure of (21) is shown in (22):

(21)   The president [_F HATES] the Delft china set.

(22)   *Verb focus:*
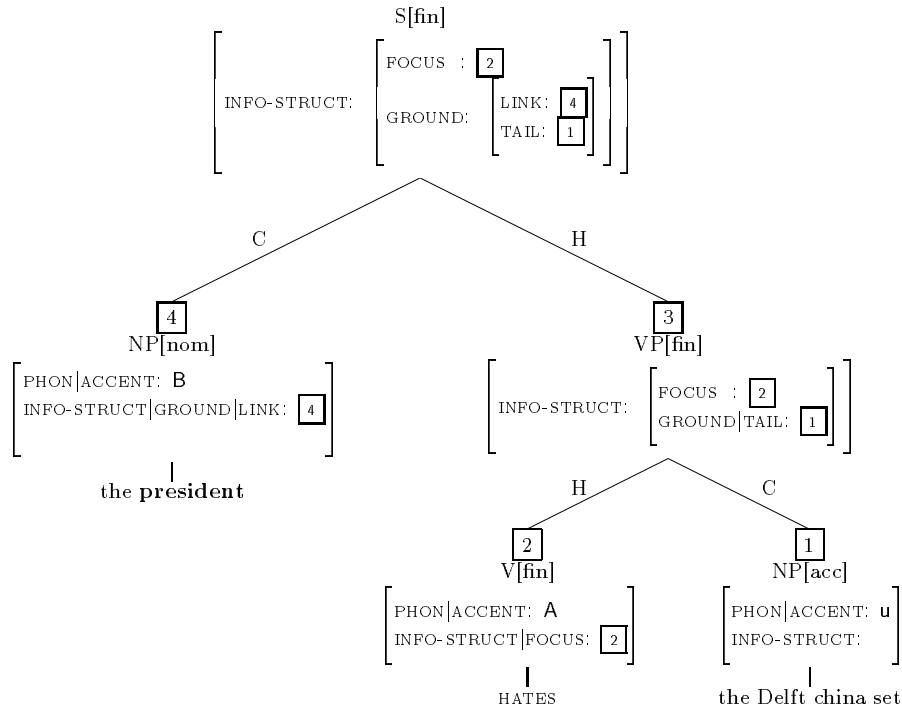
Here the value of FOCUS in VP[fin] is obtained via inheritance from the head daughter. There is no option for projection. Principle (15ii) cannot apply because no complement daughter of VP[fin] has an instantiated INFO-STRUCT|FOCUS feature. Instead the values of INFO-STRUCT are obtained via (15i). As a consequence, as in example (17) above, the unaccented NP[acc] daughter of VP[fin] cannot be interpreted as focal and instantiates the value of GROUND|TAIL in VP[fin]. We also predict that in cases like (23) there is no focus projection:

(23)   The **president** [_F CALLED.]

The verb *called*, whose FOCUS feature is instantiated, is not a complement daughter and, therefore, focus inheritance by (15i) must apply.[16]

An advantage of using the multidimensional representation in HPSG is that we are not forced to assume that focus-ground partitioning corresponds directly to structural units either in PHON or in DTRS. For instance, in (17) the GROUND material does not form a syntactic

---

[16]It has been claimed that examples like (23) may have an all-focus reading. However, Vallduví (1992), among others, argues that the subject in these sentences is always ground, even when such sentences answer questions of the type *What's new?*.

constituent, but the appropriate instantiations are achieved by a combination of bottom-up (accent assignment) and syncategorematic (Head-Complement schema) processes. The same applies to the case in (18) where only the verb is focused. We are thus not forced to assume that informational partitioning must correspond to syntactic constituency or intonational phrasing. Another case in point can be illustrated with examples like (24), analogous to example (56) in Steedman (1991:284):

(24)   What happened to the china set?
       [F The BUTLER BROKE] the set.

The focus, as identified by the question in (24), is constituted by the subject NP and the verb. The structure we assign to the answer in (24) is given in (25):

(25)   *Subject-verb focus:*
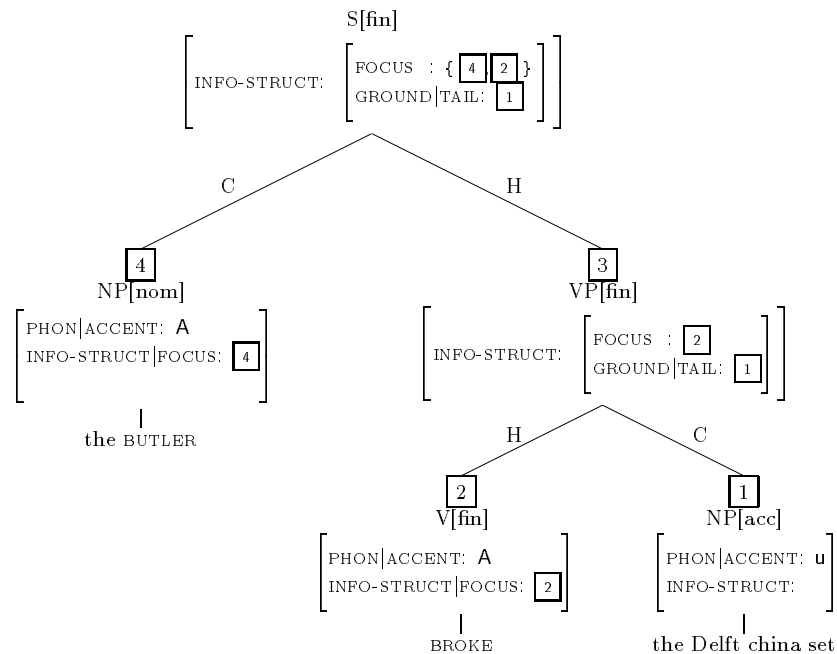
The S[fin] sign reflects the fact that both subject and verb are focal, while the object is ground. The fact that subject and verb do not form a syntactic constituent is no obstacle. Both *the butler* and *broke* are associated with an A-accent and so their FOCUS value is instantiated. In accordance with (15i), their FOCUS values are inherited by their respective mother nodes. The desired reading in (25) can be captured thanks to the use of a set value for FOCUS. FOCUS can take a set of feature structures as value. Set values are widely used in HPSG (see Manandhar 1994b for an attributive logic for set-valued feature terms).[17]

Set values can also be used to account for cases of so-called multiple focus like the one illustrated in (26):

---

[17] In fact, TAIL and LINK also take set values. The tail is often composed of more than one phrase and links, although with much lesser frequency, may be complex too.

(26)   Who did your friends introduce to whom?
       John introduced BILL to SUE, and **Mike**...

In the answer in (26) there are two constituents, *Bill* and *Sue*, that appear to behave like foci. They are associated with an accent and instantiate a wh-element in the corresponding question. We follow Krifka (1991–92:21) in analysing cases like (26) not as multiple foci but rather as a single complex focus. Sentence (26) has one single ground and one single, albeit complex, focus. Once this view is adopted, the principles in (15) handle these cases in a fashion analogous to the treatment of (24). The value of FOCUS in S[fin] in examples like (26) is the set of the feature structures that make up the complex focus. The structure of (26) is illustrated in (27):

(27)   *Complex focus:*
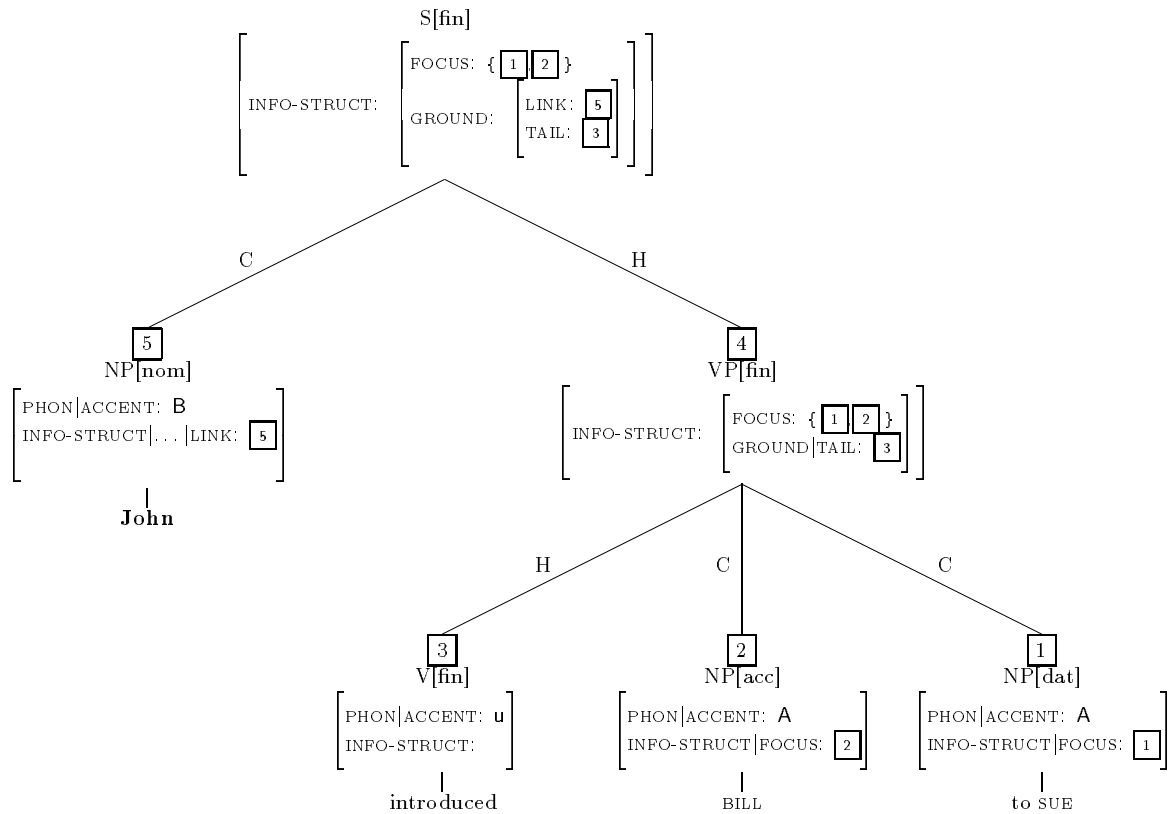
Inheritance of FOCUS values works according to (15i): the mother node VP[fin] inherits the FOCUS values of NP[acc] and NP[dat] and, in turn, S[fin] inherits the focus values of VP[fin]. According to Krifka, example (26) also gives rise to a wide-focus reading. The instantiation principles in (15) correctly allow for this, since the instantiated FOCUS of NP[dat] can undergo projection.[18]

---

[18]If *John* in (26) were not a link, one could answer the same (or similar) question with a sentence in which *Bill* was a (B-accented) link and *Mary* an A-accented focus. This is quite common when answering multiple wh-questions and has been noted for a number of languages (see Kuno and Robinson 1972). In such an event, of course, the answer in question is not a multiple or complex focus sentence.

Example (28) is an adapted version of Steedman's (1991:283) example (54). Sentence (28) is parallel to (24) above but for one thing: even though the verb is part of the focus, there is no pitch accent on it:

(28)   [$_F$ FRED ate] the beans.

A sentence of this type is problematic for our approach because, without the association of the verb with an A-accent, it is impossible to recover its focal value. However, such strings are only possible when the verb is highly predictable or uninteresting (see Bolinger 1989, Zacharski 1993) and even then, as Steedman himself admits (1991:283) the accented version represents an improvement over the unaccented one (e.g. a version of (24) with an unaccented *broke* is not viable). In light of these facts, we suggest that in examples like (28) we are witnessing the effects of an independent process of deaccenting (see Section 3). This view appears to be in harmony with the phonological evidence (Bob Ladd, personal communication). How to express the phenomenon of deaccenting in a declarative framework like HPSG is an important issue that has to be addressed but remains outside the scope of our research.

4.2   Catalan

Let us now turn to Catalan. As noted, in Catalan informational interpretation is signalled by syntactic position rather than by accent type. Examples (29) to (31) illustrate the particular pattern found in Catalan. Every (nonweak) phrase within the sentential core is interpreted as focal. In (29) the string verb+oblique+subj is the focus of the sentence:

(29)   Ahir   [$_F$ va tornar   a Barcelona el   PRESIDENT.]
       yesterday   3s-past-return to Barcelona the president
       'Yesterday the president returned to Barcelona.'

If an argument of the verb is to be interpreted as nonfocal, it is necessarily detached away from the sentential core. This configuration is called clitic-dislocation in Cinque (1990). This is the case with the locative in (30) and the subject in (31):

(30)   a. A Barcelona$_1$ [$_F$ hi$_1$ va tornar t$_1$ el PRESIDENT.]
       b. [$_F$ Hi$_1$ va tornar t$_1$ el PRESIDENT,] a Barcelona$_1$.

(31)   a. El president$_1$ [$_F$ va tornar a BARCELONA t$_1$.]
       b. [$_F$ Va tornar a BARCELONA t$_1$,] el president$_1$.

As noted in Section 1, phrases associated with a link interpretation are left-detached whereas phrases associated with tail interpretation are right-detached. The only difference between the (a) and the (b) sentences in (30) and (31) is in the ground informational contribution the detached phrases make. In order to introduce left- and right-detached phrases, we postulate a language-particular ID schema that introduces these phrases as sisters of S and simultaneously determines that their INFO-STRUCT|GROUND values are instantiated:[19]

---

[19]Systematic differences between this kind of detachment and other unbounded dependencies motivate the use of a separate Head-Dislocation Schema rather than subsuming these constructions under the Head-Filler

(32) *Head-Dislocation Schema for Catalan:*
The DTRS value is an object of sort *head-disloc-struc* whose HEAD-DTR|SYNSEM|LOCAL| CAT-EGORY value satisfies the description [HEAD *verb*[VFORM *finite*], SUBCAT <>] and and for each DISLOC-DTR, its DISLOC-DTRS|CONTEXT|INFO-STRUCT|GROUND value is instantiated and the HEAD-DTR|SYNSEM|LOCAL|CONTENT value contains an element which stands in a *binding* relation to that DISLOC-DTR.[20]

The first clause requires the head-daughter to be a finite sentence. The second clause requires that the informational contribution of dislocated phrases be GROUND. Note that the schema allows for more than one dislocated phrase, which is desirable given that there are no ordering restrictions on dislocations. The association between the directionality of the detachment and the GROUND value can be captured using an LP statement to constrain the order in which link, focus, and tail are realised in Catalan:

(33) LP constraint on INFO-STRUCT instantiation in Catalan:
LINK > FOCUS > TAIL

The LP statement in (33) states that link must precede foci and that foci must precede tails. Thus it will follow that left-detachments are always associated with a linkhood interpretation and right-detachments with tailhood.

The instantiation of INFO-STRUCT in phrasal signs in Catalan is very simple. Material within the core clause is always instantiated as FOCUS. We can stipulate that the value of INFO-STRUCT|FOCUS in the core S[fin] sign is always itself. With this proviso, it is easy to see that Catalan makes use only of inheritance (15i). When the core S[fin] unifies with the clitic-dislocated constituents, the mother S always inherits the INFO-STRUCT instantiations of the daughters. There is no focus projection. The structure in (34), which corresponds to the link-focus example (6) in Section 1, illustrates a left-detachment structure where the DISLOC-DAUGHTER is interpreted as a link:

Schema used in Pollard and Sag (1994). The latter schema is still used to account for other unbounded dependencies. The adjunction-to-S analysis of Romance detachment is found in Rochemont (1989) and Vallduví (1992). See also Sanfilippo (1990) for a different proposal within a Unification Categorial Grammar.

[20] The *binding* relation (Dorrepaal 1994) is intended to cover both coreference, as in the case where the detached phrase is a referring expression and the bound element is a pronominal clitic (see example (34) below) and subsumption, as in cases where a detached phrase is in some sense 'compatible' with the content of the phrase in situ, such as filler-epithet dependencies or examples of detached infinitives resumed by finite forms of the same verb, as in (i):

(i) De parlar₁   no parla₁   gens.
    of speak-inf no 3s-speak at-all

    'He doesn't speak at all.'

Note that the Head-Dislocation Schema is formulated in such a way that it allows for the detachment of heads as well as nonheads. The existence of detachment configurations like (i) and other cases of verbal detachment motivate such a formulation.

(34) *Clitic left-dislocation:*

S[fin]

$$\left[\text{INFO-STRUCT:} \begin{bmatrix} \text{FOCUS} & : & \boxed{1} \\ \text{GROUND} | \text{LINK:} & \boxed{2} \end{bmatrix} \right]$$

DISLOC   H

$\boxed{2}$ $\boxed{1}$

NP[nom]   S[fin]

$\left[\text{INFO-STRUCT} | \text{GROUND} | \text{LINK:} \quad \boxed{2} \right]$ $\left[\text{INFO-STRUCT} | \text{FOCUS:} \quad \boxed{1} \right]$

el president$_1$ odia el joc de porcellana de DELFT t$_1$
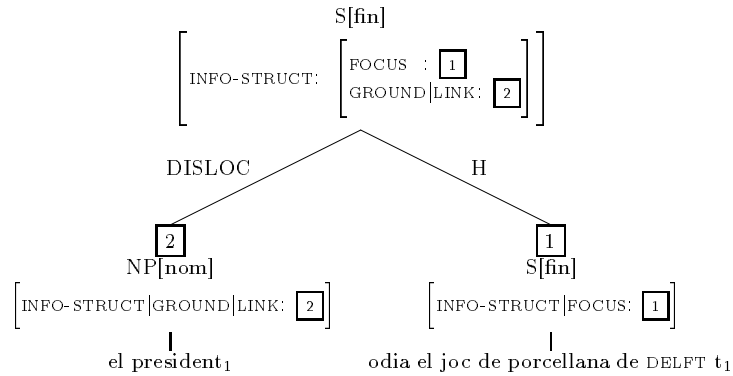
The entire head daughter, i.e. the sentential core, is the FOCUS value of the top S[fin]. The LINK value of the top S[fin] is inherited from the left-detached daughter.

A case of simultaneous left- and right-detachment is given in (35), which corresponds to the link-focus-tail example in (6). Here the top S[fin] inherits its INFO-STRUCT values from its daughters. The head daughter provides the FOCUS value, the left-detached daughter the LINK value, and the right-detached daughter the TAIL value.

(35) *Clitic left- and right-dislocation:*

S[fin]

$$\left[\text{INFO-STRUCT:} \begin{bmatrix} \text{FOCUS} & : & \boxed{1} \\ \text{GROUND:} & \begin{bmatrix} \text{LINK:} & \boxed{2} \\ \text{TAIL} : & \boxed{3} \end{bmatrix} \end{bmatrix} \right]$$

DISLOC   H   DISLOC

$\boxed{2}$ $\boxed{1}$ $\boxed{3}$

NP[nom]   S[fin]   NP[acc]

$\left[\text{INFO-STRUCT} | \ldots | \text{LINK:} \boxed{2} \right]$ $\left[\text{INFO-STRUCT} | \text{FOCUS:} \boxed{1} \right]$ $\left[\text{INFO-STRUCT} | \ldots | \text{TAIL:} \boxed{3} \right]$

el president$_1$ l$_2$'ODIA t$_2$ t$_1$ el joc de porcellana de delft$_2$
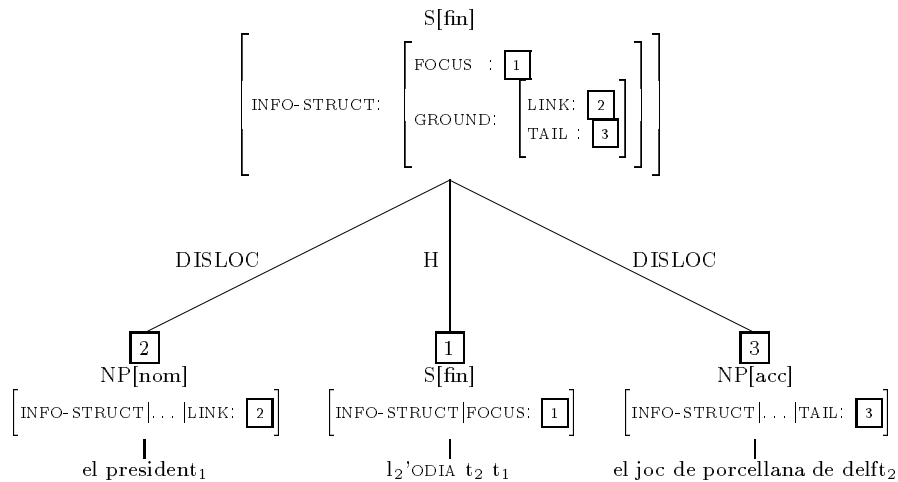
We have expressed the relationship between intonation and information structure in English by simultaneously specifying the ACCENT and INFO-STRUCT values and by subjecting them to the instantiation principles in (15). In Catalan the information-packaging contribution of a phrase is determined by its syntactic position. Again, we have linked the instantiation of INFO-STRUCT to a grammatical schema, in this case, an ID schema which licenses a particular configuration. This expresses the direct interaction between information structure and the two structural dimensions involved appropriately. Analogous strategies have been employed in the two languages.

5   Other approaches

Steedman (1991) proposes an integration of information structure into grammar using a Combinatory Categorial Grammar (CCG). CCG and HPSG share the idea that each linguistic unit—signs or categories—contains all phonological, syntactic, and semantic information pertaining to that unit. Steedman enriches categories with an intonational dimension which is intimately tied in with information structure. His information structure contains two primitives: *rheme*, which corresponds to focus, and *theme*, which corresponds to ground. There is no equivalent of the distinction between link and tail. Focus inheritance and focus projection are handled through standard combinatory rules that apply on a rich intonational structure, involving not only two types of pitch accent but also different types of boundary tones.

Steedman, however, assumes complete isomorphy between information structure, intonational structure, and syntactic constituency. His Prosodic Constituent Condition (1991:279) states that two syntactic categories can combine only if their prosodic categories can also combine. This requires that, say, the focus of a sentence—which is associated with a particular intonational phrase—correspond to a syntactic constituent. Our proposal differs in that no syntactic constituency is required for any informational unit as long as inheritance of INFO-STRUCT values proceeds in the permitted fashion. In fact, we do not require syntactic contiguity either. Given the existence of examples like (21) where the ground is made up of discontiguous segments, we consider this a positive feature of the HPSG analysis.

As noted in Section 1, linkhood is associated with a B-accent in English but a left-hand syntactic slot in Catalan. Focushood, while free to associate with any constituent in English, is inherently associated with the core S[fin] in Catalan. We take this to indicate that in Catalan one should express the combination of focus and ground elements independently of the phonological dimension, just as we largely ignored the syntactic dimension of the sign in expressing the realisation of information structure in English. The HPSG analysis allows us to express the mutual constraints that hold between syntax and information structure in Catalan without having to assume that either of these dimensions is isomorphic to intonational structure. This differs from the CCG analysis, where intonational structure necessarily reflects syntactic structure.

The proposal in Vallduví (1992:115-138) uses a GB-based multiple-level architecture. In (most versions of) GB each sentence is a bundle of abstract levels of representation. Each level of representation structurally represents one of the different linguistic aspects of the sentence. For instance, D-structure is a pure representation of argument or θ-structure and LF is a representation of operator-variable relations. Which level should information-packaging relations be represented at? In Vallduví (1992) the mapping between information packaging and the structural components through which it is realised is effected through a distinct, pure level of representation called IS (for information structure). This level feeds and bleeds the interpretive information-packaging component and consists of an unambiguous syntactic representation of information-packaging instructions.

This approach differs from the HPSG proposal put forth here in a number of respects. For one thing, the GB architecture does not allow for direct interaction between (suprasegmental) phonology and the intepretive components. Thus, in accounting for the English facts, we cannot bypass syntactic realisation in the way we did in Section 2. For instance, in the analysis above, the presence of ACCENT:B in a feature structure makes this feature structure the value

of INFO-STRUCT|GROUND|LINK. It does not matter where the B-accented constituent is in the sentential structure. However, within the GB proposal in Vallduví (1992), linkhood necessarily has to be associated with a structural position, since there is no room for prosodic information at IS. The solution is to propose that at IS all links appear in the same structural position (i.e., those B-accented items that appear elsewhere in the clause move to that position in the mapping from S-structure to IS) and that it is this particular structural position which, at IS, is inherently associated with a link interpretation. Of course, the choice of this structural position is not completely arbitrary: it is a left-hand IP-adjunction (or S-adjunction) slot. Indeed, English links may optionally appear in such a slot and Catalan links *must* appear in such a slot. But the fact that in English accent seems to be the crucial determinant of linkhood plays only a secondary role in such a model.

Analogous observations can be made with respect to tails and focus. Structural ambiguities of sentences where both focus inheritance and focus projection are possible are confined to PF and S-structure. In the proposal under discussion, at IS all ground elements must move to designated slots outside the sentential core, thus yielding disambiguated structures. For instance, example (16) in Section 2 would not be ambiguous at IS, since in the reading where *hates* is a tail, *hates* would have moved to a tail position. In the other reading, in contrast, no such movement takes place. English would differ from Catalan in that the former carries out in abstract syntax the syntactic operations that the latter carries out overtly.

6   Information structure and CONTENT

In the analysis presented in Section 4 information structure is represented in the CONTEXT field rather than the CONTENT field. In effect, this means that information structure is viewed, in principle, as independent of the truth-conditional dimension of meaning. This view of informational structure as essentially a communicative dimension is not universally shared. There have been several recent attempts to fold informational notions into the logico-semantic component (see von Stechow 1981, von Stechow 1991, Rooth 1985, Rooth 1992, Kratzer 1991, Partee 1991, Krifka 1991–92, Krifka 1992).

While it is true that the information structure of sentences interacts with a number of quantificational elements in an interesting way, we believe that such interaction must be represented in the grammar in a modular way. The separate representation of INFO-STRUCT and CONTENT is intended to capture this belief. Of course, taking this approach means that, at some point, we must undertake the task of describing how the interaction between information structure and the logico-semantic content is effected. The issue is currently under investigation and not much will be said about the specifics of the analysis here. Instead, this section discusses the empirical motivation for an architecture where information structure and logico-semantic content are represented in a modular way.

In a number of recent papers the focus-ground partition has been analysed as a determinant of quantificational partition, where the focus identifies the nucleus (nuclear scope) of an operator and the ground identifies its restrictor (Partee 1991, Krifka 1992):

(36)   Tripartite quantificational structure:

```
                      S
              _____|_____
             /        |        \
        OPERATOR  RESTRICTOR  NUCLEUS
            |         |          |
          even      ground     focus
```
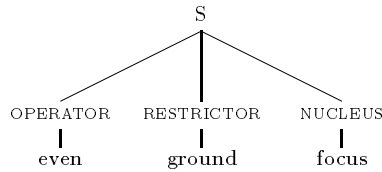
The stimulus for such an approach is the behaviour of so-called focus-sensitive operators (e.g. *even*, *only*, quantificational adverbs, negation, modals). Jackendoff (1972:248), among others, notices that sentences (37a-c) cease to be equivalent in propositional content in the presence of these focus-sensitive operators (38):

(37)   a. What did John do?
           John [$_F$ gave his daughter a new BICYCLE].

       b. What did John give his daughter?
           John gave his daughter [$_F$ a new BICYCLE].

       c. Who did John give a new bicycle?
           John gave [$_F$ his DAUGHTER] a new bicycle.

(38)   a. John even [$_F$ gave his daughter a new BICYCLE].

       b. John even gave his daughter [$_F$ a new BICYCLE].

       c. John even gave [$_F$ his DAUGHTER] a new bicycle.

The VP-external adverb *even* in (38a-c) is interpreted as being construed with, i.e. as associating with, the constituents enclosed in brackets. Having identified the bracketed constituents as foci, Jackendoff concludes that *even* associates with focus. Thus, configurations where the nucleus of an operator coincides with the focus of the sentence have been called instances of 'association with focus'.

From the aforementioned recent semantic perspective, the primary function of focus-ground is to provide a quantificational structure for these focus-sensitive operators. The communicative use of focus-ground is merely one of the uses this quantificational structure serves (assuming there is a covert focus-sensitive communicative operator akin to ASSERT in Jacobs 1984). Given this view of focus-ground it is actually imperative that focus-sensitive operators take focus-ground partitions as arguments, since they crucially depend on the structure provided by focus-ground to express their meaning. This type of analysis makes two predictions. First, it predicts that the quantificational structure of a focus-sensitive operator is *always* homomorphic to the focus-ground articulation of the sentence, and, second, it predicts that monoclausal sentences with more than one focus-sensitive operator contain multiple focus-ground partitions (overlapping or recursive), something which is at odds with the traditional view of focus-ground.[21]

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[21] In recent unpublished work Partee has expressed the view that focus-ground normally serves as the source of nucleus and restrictor, but in some contexts nucleus-restrictor and focus-ground may run orthogonal to each other. As will become evident in what follows, this is precisely our belief as well.

The first prediction is not met. On the one hand, it is well known that some operators, e.g. negation, display optional association with focus. Thus, example (39c), with a focal *because*-phrase, can be an answer to both (39a) and (39b). In the association-with-focus reading something the utterer of (39c) admits to having done something while negating that the querier was the reason for her doing it. In the reading where negation does *not* associate with focus—it remains in the ground—the utterer of (39c) simply provides a reason for why she did not do whatever she whatever she is being asked about:

(39)   a. Why did you do it?
       b. Why didn't you do it?
       c. I didn't do it [F because of YOU].

On the other hand, there are clear mismatches of quantificational partition and focus-ground even with strongly focus-sensitive operators. Example (40), where the verb phrase is focal, is a case in point involving the quantificational adverb *often*:

(40)   Scandinavians often [F win the Nobel PRIZE.]

In (40) the focus should provide the quantificational nucleus and the ground should provide the restrictor, which restricts the domain over which quantification occurs. If this were so, (40) would mean that, given those situations/times in which Scandinavians do something (among a relevant set of alternatives), this something is often winning the Nobel prize. While this is a marginally possible reading in some contexts, it is not the most accessible reading of (40). Rather, what (40) means is that given those situations/times in which someone wins the Nobel prize, it is often Scandinavians that win it. The quantificational nucleus is provided by *Scandinavians*, a ground element, and the restrictor is provided by the informational focus. Similar observations can be made about Westerståhl's (1985:403) original example, which does not involve adverbial quantification but rather determiner quantification:

(41)   Many Scandinavians [F have won the Nobel prize in LITERATURE.]

The meaning of (41) is that, out of all the people who have won the Nobel prize in literature, many are Scandinavians, precisely the reading where the focus acts as restrictor. If the focus were the nucleus, the meaning of (41) would have been that, out of all Scandinavians, many are Nobel prize winners, something which is blatantly false. This behaviour, quite unexpected from the perspective that focus-ground equates quantificational partition, is perfectly legitimate from a perspective where information packaging and logico-semantic content may constrain each other as separate dimensions.

It is harder to check the validity of the second prediction—that all quantificational nuclei are foci and, thus, that monoclausal sentences may have multiple focus-ground articulations— because of disagreement on what exactly should count as focus or ground. Some analysts take accentedness to be a necessary and sufficient condition to identify a focus. Others judge it to be a sufficient condition but not a necessary one: it is argued that, even though monoclausal sentences with more than one focus-sensitive operator contain more than one focus, one of the foci may remain unaccented. The end result is that, on some occasions, we identify a constituent as focal uniquely on the basis of it being in association with a focus-sensitive operator.

The issue is discussed in Vallduví and Zacharski (1994), where the relationships between informational focus, quantificational nucleus, and intonational focus (pitch accent) are explored in detail. They show that quantificational nuclei can be informational foci, informational links, or even unaccented constituents within a larger focus. In addition, it is known that the focus-sensitive operators themselves may be focal or may be ground (Koktová 1987). The conclusion Vallduví and Zacharski (1994) arrive at is that quantificational partition is independent of focus-ground and that, therefore, the presence of more than one so-called focus-sensitive operator in a monoclausal sentence does not entail the presence of more than one focus-ground articulation. It is true that quantificational partition and the focus-ground articulation are very often isomorphic, but unless their independence is maintained, the numerous examples where there is a mismatch between the two dimensions remain unaccounted for.

As we saw, in examples (40) and (41) the quantificational partition of the sentence is not provided by the focus-ground partition. Rather, the information about what should go into the restrictor and what should go into the nucleus comes from the more general context of utterance, probably knowledge about the world (e.g. about the Nobel prize competition, about the number of Scandinavians out there). The need to appeal to more general background knowledge is not restricted to this type of sentences, though. Take, for instance, an example like (42), based on a similar example in Schubert & Pelletier (1989:215):

(42)   John always hits the target.

In (42) the quantification is restricted to events in which John is shooting, although there is no overt expression of this restriction in the sentence. Clearly, the restriction to events of this type, the *reference ensemble* in Schubert & Pelletier's terms, must be made available by previous context or by world knowledge. In all these examples we need to resort to a source other than focus-ground for the quantificational partition of the sentence.

The issue is whether this same source—whatever it is exactly—is what determines quantificational partition even in cases in which this partition is isomorphic with focus-ground. In other words, are cases in which the ground is the restrictor just a subset of the cases in which the restrictor is made available from context? If this is so, then the grammar should not require the identity of ground and restrictor, but rather support the generalisation that grounds possess the necessarity attributes to be premium sources of quantificational restriction. However this generalisation is captured, the nonidentity of focus-ground and nucleus-restrictor is conceptually clear.

7   Conclusion

The view we have adopted from the outset is that information packaging can be characterised as a set of language-independent instruction-types and that informational primitives are definable independently from their realisation. Using these language-independent primitives and instructions as analytic tools, it becomes evident that the range of crosslinguistic variation in the realisation of information packaging is quite substantial. We have focused on English-type languages, in which intonation acts as the primary structural dimension for the realisation of information packaging, and on Catalan-type languages, where this role is played

by syntax (dominance and precedence relations).

We believe that a multidimensional sign-based grammatical framework like HPSG is optimally suited to provide a revealing description of the crosslinguistic facts in a principled manner. We have represented information packaging as an independent dimension within the sign, which is available at every single level along with all other dimensions. For English the mutual constraints between ACCENT and INFO-STRUCT were described without requiring mediation by syntax or isomorphy of intonational, informational, and syntactic constituency. For Catalan, we described the mutual constraints between syntactic position and INFO-STRUCT without needing to refer to the PHON feature at all. The same approach can easily be extended to cover languages that use a morphological strategy to realise focus-ground partitions. Information structure is treated as an independent dimension of the sentence which may be 'folded into' the prosody or the word order in different ways, depending on the language. Even though we have not proposed an explicit account of the relationship between information structure and some aspects of CONTENT, we did sketch out what requirements the mutual constraints between the two dimensions would have to meet.

Keeping information structure independent of prosody and syntax provides an explanatorily adequate means of capturing the interpretative focus-ground identity of structurally dissimilar constructions in different languages, but there are additional advantages of a utilitarian nature. In multi-lingual applications, for instance, it would appear to be useful to be able to use high-level generalisations about instruction-types so that the appropriate correspondences could be established. In addition, given that information packaging is concerned with the process of updating the hearer's information state by linguistic means, the availability of these high-level generalisations should facilitate the interface between natural language processing tools such as a dialogue handler or a database query system and the general reasoning procedures that have to be assumed in order to model an NLP system.

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Parasitic Gaps and Coordination in HPSG

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Abstract

Similarities between certain parasitic gap examples and examples of across-the-board extraction from coordination have made it tempting to try to treat parasitic gap structures as coordinate. However, attempts to bring the two phenomena together have not been particularly successful because certain other parasitic gap examples do not lend themselves at all to a coordinate analysis. I identify two classes of parasitic gap, a-type and c-type (standing for *anaphor-like* and *coordination-like* respectively), and I argue that these do not constitute a unified phenomenon. In accordance with Engdahl's (1983) original observations, a-type parasitic gaps are best treated as having a distribution governed by the binding theory. C-type parasitic gaps, on the other hand, really do pattern with across-the-board extractions from coordinations and I show how the HPSG theory of coordination can be generalised to cover a broader class of conjunctive structures which includes c-type structures. The new analysis controls gap distribution in both c-type parasitic gap constructions and in coordinations. Extractions usually occur in an across-the-board fashion but this pattern may be violated in asymmetric conjunctive structures, thereby accounting not only for the optionality of c-type parasitic gaps but also for certain well-documented examples of coordinations where the across-the-board condition does not hold.

1   Introduction

In this paper I discuss English constructions which contain multiple gaps associated with a single filler. Some examples are shown in (1)–(3).

(1)   Which report did John file _ but not read _?

(2)   Which report did John file _ without reading _?

(3)   Which report did John tell the authors of _ to revise _?

The standard description of the relationship between these examples is that (1) is an instance of across-the-board (ATB) extraction from a coordinate structure and, as such, it is different from the examples in (2) and (3), both of which are parasitic gap constructions.[1] All three cases involve two gaps depending on a single filler but, in the coordinate case in (1), the gaps are thought to have equal status while, in the parasitic gap examples in (2) and (3), it is assumed that one gap is the primary or 'real' gap while the other gap is parasitic on or licensed by the primary gap. Thus in spite of the obvious syntactic and semantic similarity that (2) bears to (1), the traditional view is that (2) is more closely related to (3) and must be treated using the same mechanisms.

In Grover (1995) I examine parasitic gap constructions and I argue that they do not form a unified class. I propose that a more satisfactory account can be achieved if we identify two distinct types of parasitic gap construction which receive quite different analyses. (2) belongs to one class (which I call *c-type* for 'coordination-like') and (3) belongs to the other class (which I call *a-type* for 'anaphor-like'). In making this distinction I claim that the standard view of the relationship between the examples in (1)–(3) is incorrect. In my account the same mechanism lies behind both (1) and (2) while (3) is treated by quite separate means.

The paper is structured as follows. Section 2 provides a general motivation for the proposal that there are two quite separate kinds of parasitic gap construction. In Sections 2.1–2.3 I give a brief introduction to the parasitic gap data and provide an overview of the accounts of parasitic gaps from Engdahl (1983) and Pollard and Sag (1994). The former places more emphasis on the similarities between parasitic gaps and anaphora, while the latter derives parasitic gaps as a side effect of an account of unbounded dependencies using the SLASH feature. In Section 2.4 I discuss some problems with the Pollard and Sag (1994) treatment of parasitic gaps, thereby motivating the need for a fresh look at parasitic gaps in HPSG, and in Section 2.5 I propose the distinction between c-type and a-type parasitic gaps. The

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[1] The term 'across-the-board' comes from Ross (1967). Ross proposed the Coordinate Structure Constraint (CSC) which forbids the extraction of a conjunct or any part of a conjunct from a coordinate structure. He went on to show that this constraint can be violated if the extraction happens in an across-the-board fashion, i.e. if the same element is extracted from all of the conjuncts. This accounts for the following contrast.

(i)   CSC violation:
          *Which book did you either buy _ or borrow a magazine from Lee?

(ii)   ATB exception to CSC:
          Which book did you either buy _ or borrow _ from Lee?

main focus of this paper is an HPSG analysis of c-type parasitic gaps and, for this reason and because of space limitations, I refer readers to Grover (1995) for details of my treatment of a-type parasitic gaps.

In Section 3 I present an account of c-type parasitic gaps which reflects the similarities with across-the-board extractions from coordinations. In Section 3.1 I examine a number of ways in which c-type parasitic gap constructions pattern with coordination. In Section 3.2 I review some published attempts to analyse parasitic gaps as instances of ATB extraction from coordination, notably Huybregts and van Riemsdijk (1985) for Dutch and Williams (1990) for English. I conclude that the optionality of the parasitic gap leads to problems for attempts to treat parasitic gap structures as coordinate structures and I suggest that reanalysis as coordination is not necessary. The same mechanism can be used for both types of structure if we relinquish the idea that the ATB pattern occurs exclusively in coordinations. In Section 3.3 I review papers by Goldsmith (1985) and Lakoff (1986) which deal with non-ATB extractions from coordinations. In Section 3.4 I provide an analysis of c-type parasitic gaps which exploits the conjunctive nature of the constructions in which they occur and I replace Pollard and Sag's Coordination Principle with a Conjunction Principle. I show that the optionality of c-type parasitic gaps patterns with violations of the across-the-board condition in true coordinations and I develop an account which controls gap distribution in both c-type parasitic gaps and coordinations.

2   Are Parasitic Gaps a Unified Phenomenon?

2.1   The Data

Below are data from Engdahl's (1983) description of parasitic gaps grouped according to my own classification (Engdahl's numbering is indicated in square brackets on the right of each example). Where appropriate, I indicate primary gaps by means of an underscore and parasitic gaps with an additional subscripted p. This marking of gaps is not meant to imply any particular analysis of the examples and is used simply for expository purposes to indicate missing or displaced material.

Group 1: Parasitic gaps in *without*-type adjuncts

In these examples the parasitic gap occurs to the right of the real gap. The real gap occurs in a VP and the parasitic gap is contained in a VP adjunct with propositional content (i.e. an adjunct containing a non-finite VP or a finite S). The non-finite VP examples (usually -*ing* form VPs) as in (4) are more common while examples involving finite S as in (5) are less common.

(4)   Which articles did John file __ without reading __$_p$?   [E1]

(5)   This is the kind of food you must cook __ before you eat __$_p$.   [E2]

Group 2: Parasitic gaps in other adjuncts

Adjuncts other than the *without*-type ones can also contain parasitic gaps:

(6)   ?The blintzes which Sasha is gobbling __ down faster than I can
        reheat __$_p$ are extremely tasty, if I do say so.   [E11]

(7)   Here is the influential professor that John sent his book to __ in order
        to impress __$_p$.   [E14]

The example in (6), which demonstrates a parasitic gap in a comparative adverbial, comes originally from Ross (1967) and the judgement is his. (7) shows a parasitic gap in an 'in-order-to infinitive'.

Group 3: Parasitic gaps in subjects

These examples are ones where a subject and the VP to which it is related contain a gap. The parasitic gap can be identified as the one in the subject since extractions from subjects are not otherwise possible.

(8)   Which boy did Mary's talking to __$_p$ bother __ most?   [E4]

(9)   Which student did your attempt to talk to __$_p$ scare __ to death?   [E45a]

A sub-class of this group of examples are ones where the parasitic gap occurs not just inside a subject but inside a relative clause which modifies that subject:

(10)   This is the type of book that no-one who has read __$_p$ would
        give __ to his mother.   [E48]

(11)   Here is the boy who everyone who has met __$_p$ thinks __ is clever.   [E49]

The parasitic gap is therefore in a position which would normally be unacceptable on two counts: extractions from subjects are usually disallowed and so are extractions from relative clauses. Note that these examples are unacceptable for many people.

Group 4: Parasitic gaps in non-subject arguments

In these examples both gaps occur in non-subject arguments of the same predicate. In these cases it is not entirely obvious which is the real gap and which is the parasitic gap. In most other examples, one gap occurs in a position which is not normally available as a gap location (e.g. in an adjunct, in a subject) and it is this one which is taken to be the parasitic gap. In these examples, however, both positions are usually perfectly normal gap positions so other factors have to determine which is the real gap and which is the parasitic gap. The decisions indicated are Engdahl's except in the case of (13) where I have inferred what her decision would be.

(12)   Which girl did you send a picture of _ to _$_p$?   [E3,E74]

(13)   Which professor did you persuade the students of _$_p$ to nominate _ for
          the Distinguished Teacher's Award?   [E15]

(14)   ?Which students did you persuade _ to invite us to come and see _$_p$?   [E17]

(15)   ??Who did you tell _ that we were going to vote for _$_p$?   [E18]

The examples in (14) and (15) are relatively unacceptable and, indeed, Engdahl places them low in her hierarchy of acceptability.

The four groups above are my categorisation rather than Engdahl's. Engdahl has two ways of categorising parasitic gaps: first into a hierarchy of acceptability and, second, according to whether they are optional or obligatory. The terms 'optional' and 'obligatory' reflect whether they can be replaced by a pronoun coreferential with the real gap or not: if they can, they are optional and if they cannot, they are obligatory. The parasitic gaps in the first two of my four groups seem to be optional—as the examples in (16) and (17) demonstrate. As (18) shows, parasitic gaps in the third group are obligatory except perhaps for the relative clause sub-group—(18c) does not seem entirely unacceptable. (19) deals with the fourth group. Here the good examples in (12) and (13) are rendered unacceptable by the insertion of a pronoun while the not so good examples in (14) and (15) are considerably improved.

(16) a.   Which articles$_i$ did John file _$_i$ without reading them$_i$?

     b.   This is the kind of food$_i$ you must cook _$_i$ before you eat it$_i$.

(17) a.   The blintzes$_i$ which Sasha is gobbling _$_i$ down faster than I can
             reheat them$_i$ are extremely tasty, if I do say so.

     b.   Here is the influential professor$_i$ that John sent his book to _$_i$ in order
             to impress him$_i$.

(18) a.   *Which boy$_i$ did Mary's talking to him$_i$ bother _$_i$ most?

     b.   *Which student$_i$ did your attempt to talk to him$_i$ scare _$_i$ to death?

     c.   ?This is a book$_i$ that no-one who has read it$_i$ would give _$_i$ to
             his mother.

(19) a.   *Which girl$_i$ did you send a picture of _$_i$ to her$_i$?

     b.   *Which professor$_i$ did you persuade the students of his$_i$ to nominate _$_i$
             for the Distinguished Teacher's Award?

     c.   Which students$_i$ did you persuade _$_i$ to invite us to come and see them$_i$?

     d.   Who$_i$ did you tell _$_i$ that we were going to vote for them$_i$?

2.2   Engdahl's Account

When discussing the distribution of parasitic gaps, Engdahl observes that the real gap must not c-command the parasitic gap. Because anaphoric relations are also constrained by c-command, this results in a correlation between the possibility of parasitic gaps and the possibility or non-possibility of certain types of anaphora. Government-Binding Theory (GB) controls the coindexation of anaphoric elements by means of the three principles of the binding theory as shown in (20).

(20)   A.   An anaphor must be bound in its governing category.

B.   A pronoun must be free in its governing category.

C.   An R-expression must be free everywhere.

Engdahl sometimes describes the distribution of parasitic gaps as being inversely correlated with the possibility of anaphors and this follows from the fact that anaphors must be bound in their governing categories (Principle A), and parasitic gaps must not. Elsewhere, Engdahl refers to a constraint on non-coreference and describes the positions where parasitic gaps are disallowed as being the positions where non-coreference for non-anaphoric, non-pronominal NPs is required. This is effectively the situation that Principle C describes. This clause ensures that ordinary NPs cannot be bound by a c-commanding category but there is nothing to prevent them being coindexed to a non-c-commanding category since this falls outside of the scope of the binding theory. The following examples illustrate this point:

(21)   a.   *He$_i$ annoyed Oliver$_i$.

b.   Those rumours about him$_i$ annoyed Oliver$_i$.

c.   *He$_i$ says that Oliver$_i$ is kind.

d.   His$_i$ mother says that Oliver$_i$ is kind.

(21a) and (21c) are ill-formed with the coindexing indicated because the antecedent c-commands the R-expression. (21b) and (21d), on the other hand, are fine because the antecedent does not c-command the R-expression.

Parasitic gaps, then, are like R-expressions in that they cannot be coindexed with a c-commanding category. With the exception of (14) and (15), all of the parasitic gaps in the examples in Groups 1–4 in the previous section are not c-commanded by the real gap. The examples in (14) and (15) are more problematic because the real gap does c-command the parasitic gap and so these ought to be ill-formed. Examples such as these are a matter of some controversy: Hukari and Levine (1987) treat them as entirely unacceptable and go to some lengths to prevent them being generated in GPSG. By contrast, Engdahl (1984) assumes they are acceptable and finds it a virtue of the GPSG account that it generates them and a failing of the GB account that it does not. She goes to some lengths to modify the GB account so that it will not reject them.

We can now turn to cases where parasitic gaps are disallowed. As (22) shows, where the real gap is a subject gap it c-commands all the positions in its VP sister and so a parasitic gap cannot occur in the VP:

(22)   *Who did you say __ was bothered by John's talking to __$_p$?   [E58]

Similarly, Engdahl attributes the difference in acceptability between (23a) and (23b) to differences in c-command. In (23a) the real gap does not c-command the parasitic gap because the *while* adjunct attaches high to the VP headed by *imply*. In (23b), on the other hand, the adjunct attaches low to the VP headed by *filed* and this means that the real gap c-commands the parasitic gap—for this reason (23b) is ill-formed.

(23) a.   Which Caesar did Brutus imply __ was no good while
                 ostensibly praising __$_p$?   [E60]

      b.   *Which articles did you say __ got filed by John without
                 him reading __$_p$?   [E57]

In (24a), the NP object of *give* c-commands the object of the preposition *to* so a parasitic gap cannot occur there. In (24b) the two objects of *give* c-command one another so neither of them can be a parasitic gap.[2]

(24) a.   *Which slave did Cleopatra give __ to __$_p$?   [E68]

      b.   *Which slave did Cleopatra give __$_p$ __?   [E69]

By contrast, a reflexive can occur in similar examples:

(25) a.   Which slave did Cleopatra give __ to himself?

      b.   Which slave did Cleopatra give __ himself?

The data in (24) and (25) demonstrate the inverse correlation between the distribution of anaphors and parasitic gaps: if a reflexive is possible then a parasitic gap is not, and vice versa. The following data provide more examples:

(26) a.   John persuaded Mary$_i$ to look after herself$_i$

      b.   *Who did John persuade __ to look after __$_p$?

---

[2] The indications in (24) as to which gap is the real gap and which is the parasitic one are Engdahl's. It is not at all clear to me how one can tell with examples like this and it is worth noting perhaps a slight degree of circularity with respect to (24a)—if the first gap was the parasitic gap and the second was the real gap then the real gap wouldn't c-command the parasitic gap and there would be no account of why this was ill-formed.

(27) a.   *John persuaded friends of Mary$_i$ to look after herself$_i$

    b.   Who did John persuade friends of _ to look after _$_p$?

(28) a.   I talked to John$_i$ about himself$_i$ [E70]

    b.   *Who did you talk to _ about _$_p$?   [E72]

(29) a.   *I sent a picture of Mary$_i$ to herself$_i$ [E73]

    b.   Which girl did you send a picture of _ to _$_p$?   [E74]

There are known exceptions to the c-command restriction on bound anaphora, for example, in (28a) *John* does not c-command *himself* but is still able to act as its antecedent. This configuration also turns out to be an exception to the no-c-command restriction on parasitic gaps: even though the gap in (28b) does not c-command the parasitic gap, the parasitic gap cannot occur. The fact that these exceptions pattern together provides strong evidence that the two phenomena are linked and that whatever permits the exception in (28a) also causes the exception in (28b).

Although Engdahl does not specify in detail what mechanisms underly parasitic gaps, she does reach some firm conclusions, two of which are as follows:

(30) a.   Parasitic gaps are in no way related to coordinate gaps.

    b.   The distribution of parasitic gaps can be characterised using the same notions as are relevant to anaphora, i.e. c-command and binding domains.

Engdahl does not entertain the possibility that multiple gaps in parasitic gap constructions are the same as the multiple gaps which arise from ATB extractions from coordinations. Her conclusion is based partly on the observation that many parasitic gaps are optional while in general the ATB condition cannot be violated. A second reason for her conclusion is the fact that coordination is generally between constituents of the same category while in parasitic gap constructions the gap-containing constituents are frequently not of the same category.

As discussed above, her second conclusion follows from an examination of the relationship between the position of the real gap and the position of the parasitic gap. Parasitic gaps seem to pattern with R-expressions in that they must not be c-commanded by the real gap.

2.3   The Pollard & Sag Account

The HPSG account of parasitic gaps contrasts sharply with Engdahl's in that it makes no appeal whatsoever to command relations or binding theory. In Pollard and Sag (1994), parasitic gaps come about simply as a by-product of the Nonlocal Feature Principle which controls SLASH propagation:

(31)   NONLOCAL FEATURE PRINCIPLE

In a headed phrase, for each nonlocal feature F = SLASH, QUE, or REL, the value of SYNSEM|NONLOCAL|INHERITED|F is the set difference of the union of the values on all the daughters and the value of SYNSEM|NONLOCAL|TO-BIND|F on the HEAD-DAUGHTER.

The Nonlocal Feature Principle requires the INHER|SLASH set on the mother to be the union of the INHER|SLASH sets on the daughters (minus the TO-BIND|SLASH value on the head). This allows for the possibility that two daughters may be specified with the same SLASH dependency which is shared with the mother. The trees Pollard and Sag assign to (32) and (33) are shown in (34) and (35) respectively.[3]

(32)   Which vegetables should you peel __ before cooking __$_p$?

(33)   Which program are users of __$_p$ happy with __?

(34)

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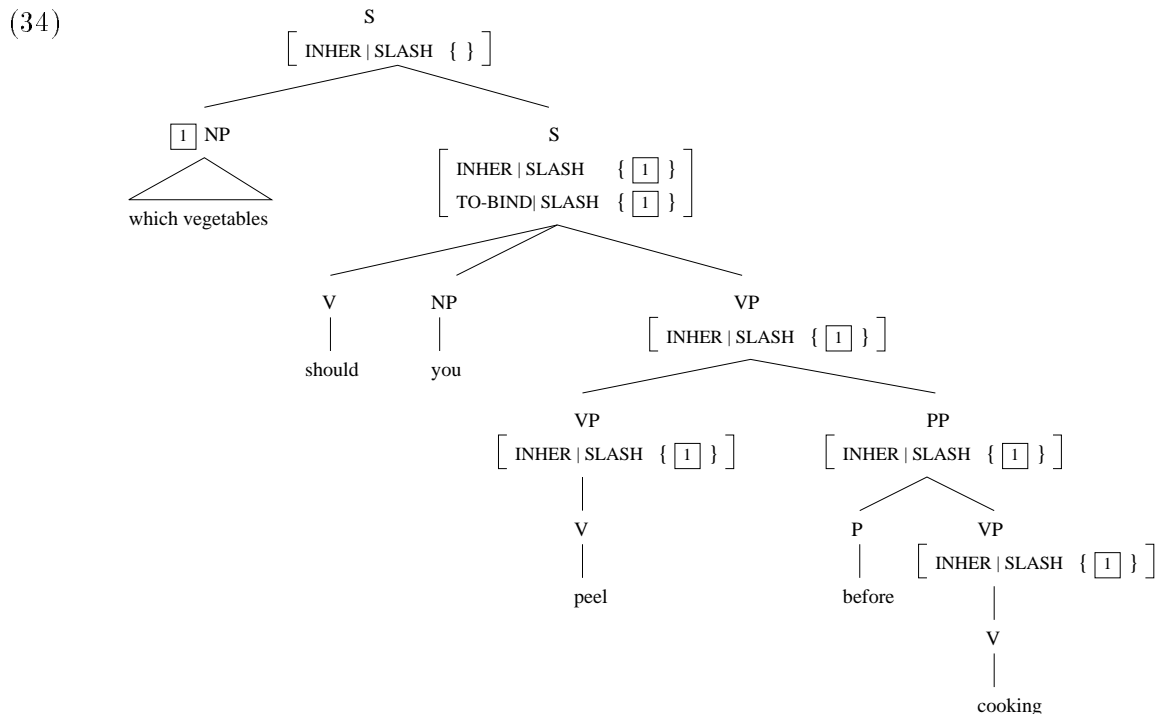
[3] Here and throughout this paper I assume the version of HPSG described in Chapter 9 of Pollard and Sag (1994) which includes a 'traceless' account of extraction—hence the lack of traces in the trees in (34) and (35). Although I adopt the traceless account of extraction, for expository purposes I will continue to refer to gaps as if they did exist and I will also continue to mark gap positions in examples in the same way as before.

(35)

```
                        S
                  [ INHER|SLASH { } ]
                 /                  \
          [1] NP                     S
           /\              [ INHER|SLASH   { [1] } ]
    which program          [ TO-BIND|SLASH { [1] } ]
                          /          |            \
                         V           NP            AP
                         |    [ INHER|SLASH {[1]} ]   [ INHER|SLASH {[1]} ]
                        are      /      \            /       \
                               N        PP          A        PP
                               |  [ INHER|SLASH {[1]} ]  |  [ INHER|SLASH {[1]} ]
                             users       |          happy      |
                                         P                     P
                                         |                     |
                                         of                   with
```
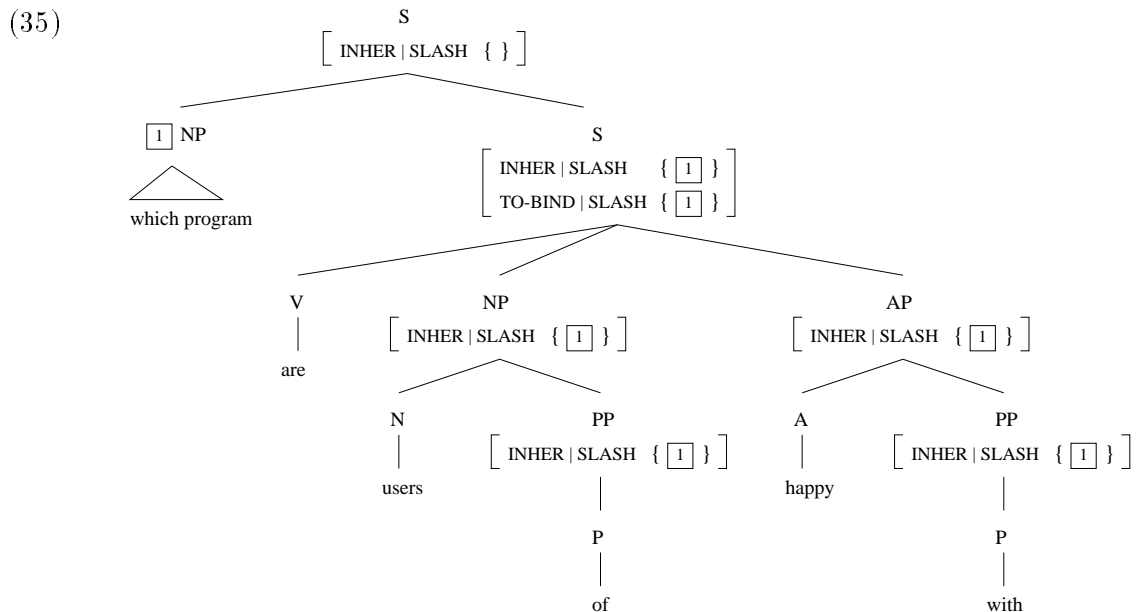
It has frequently been noted that parasitic gaps often occur in positions which are not possible sites for a lone gap. In (32) the second gap is in the adjunct and it is generally assumed that this is not a possible gap position. However, on the basis of examples such as (36), Pollard and Sag claim that lone gaps in adjuncts are in fact possible and so they argue that no additions are needed to describe possible gap locations in head-adjunct structures of the kind in (32) and (36).

(36)   Which program did you consult Kim before using _?

(37)   *Which program are serious users of _ happy with it?

(37) demonstrates that lone gaps in subjects are not permissible and, in order to block non-parasitic gaps in subjects, Pollard and Sag formulate the Subject Condition:[4]

(38)   SUBJECT CONDITION

        A lexical head's subject can be slashed only if one of its complements is.

The addition of the Subject Condition is the only addition to the theory that Pollard and Sag make and they claim that these are the only true examples of parasitic gaps. All other

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[4] In fact this definition does not work for the traceless account of extraction in Chapter 9 of Pollard and Sag (1994) because the extracted element disappears from the COMPS list. In a footnote in Chapter 9, Pollard and Sag provide the following more accurate definition which makes appeal to the SUBCAT list (via the o-command relation).

> SUBJECT CONDITION (Revised)
> A slashed subject can be realised as a constituent only if it locally o-commands a slashed element.

Even though the Complement Extraction Lexical Rule removes an element from COMPS, this version works because, as a side effect, the equivalent SUBCAT member becomes slashed.

examples they claim simply to be the result of the Nonlocal Feature Principle which allows INHER|SLASH to propagate freely from a mother to any of its non-subject daughters. As an example from Group 4 illustrates, this predicts that both the real gap and the parasitic gap can occur independently as well as together:

(39)   a. Which girl did you send a picture of __ to __$_p$?

   b. Which girl did you send a picture of __ to her mother?

   c. Which girl did you send a picture of yourself to __?

To contrast the HPSG account with Engdahl's, (40) shows Pollard and Sag's conclusions on the same points as Engdahl's conclusions in (30).

(40)   a. Coordinate gaps and parasitic gaps both arise when a SLASH path splits. However, parasitic gaps are not coordinate gaps since a mechanism particular to coordination ensures the ATB pattern. The possibility of multiple gaps in parasitic gap sentences, on the other hand, simply follows from general principles constraining SLASH propagation.

   b. There is no need to discuss the distribution of parasitic gaps in terms of notions such as c-command and anaphora domains since the correct distribution should fall out from the theory of SLASH propagation. However, they make some non-standard assumptions about the data and about what counts as a parasitic gap.

2.4   Problems with the Pollard & Sag account

In this section I present some problems with the account of parasitic gaps in Pollard and Sag (1994). I do this in order to demonstrate that there is good reason to review the standard HPSG analysis. The problems can be attributed partly to Pollard and Sag's assumption that parasitic gaps are a unified phenomenon and should be treated in the same way, and partly to their claim that a parasitic gap is always the same kind of gap as the real gap and is re-entrant with it.

2.4.1   Distributional Differences

One of the most striking facts about parasitic gaps is that they can occur in positions that are not available to normal gaps. Pollard and Sag make provision for examples where the parasitic gap occurs inside a subject: they use the Subject Condition to ensure that a gap can only occur inside a subject if a second gap also occurs in the VP which that subject agrees with. This deals adequately with straightforward examples of parasitic gaps inside subjects but it does not account for why examples involving parasitic gaps inside relative clauses in subjects should be acceptable. Some relevant examples were given in (10) and (11) in Section 2.1. (41) and (42) are similar examples:

(41)   Kim is the kind of person who everyone who meets $\_p$ immediately takes to $\_$.

(42)   That's a dish that anyone who has tasted $\_p$ will never forget $\_$.

The Subject Condition enables the SLASH dependency to pass down into the subject NP but, once it is there, there is no additional means to get it into the relative clause since a normal SLASH dependency cannot enter a relative clause. The SLASH account is able to affect the point where the SLASH path splits but once each path goes its own way, each one behaves like a normal extraction. In order to generate (41) and (42) Pollard and Sag would also have to claim that the examples in (43) are grammatical:

(43) a.   *Which person do you like everyone who meets $\_$?

      b.   *Which dish have you met someone who has tasted $\_$?

For all examples not involving subjects, Pollard and Sag argue that the parasitic gap site is a possible location for a lone gap. For example, (44) demonstrates the possibility of single gaps in the kind of adjuncts involved in the examples I classified as Group 1 in Section 2.1. For these examples the Pollard and Sag position is not implausible.

(44)   Those boring old reports, Kim went to lunch without reading $\_$.

Parasitic gaps are sometimes not able to occur in positions which are perfectly normal positions for ordinary gaps and in these cases the Pollard and Sag theory has no means to describe the distributional differences. The most striking difference in this respect is that normal gaps can be of any major category while it is widely assumed that a parasitic gap can only be an NP gap:[5]

(45) a.   *Of which artist do friends $\_$ speak well $\_p$.   (PP gap)

      b.   *About which book did you tell me $\_$ before writing $\_p$.   (PP gap)

      c.   *How clever do you think Kim actually is $\_$ without ever seeming $\_p$. (AP
            gap)

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[5] The facts are actually more complex than this. Cinque (1990) claims that parasitic gaps are restricted to being referential NPs. Postal (1993) gives examples of other restrictions on the type of NP. Postal (1994) shows examples of sentential complement parasitic gaps although he claims that these are not true parasitic gaps. See Grover (1995) for discussion. Engdahl (1983) gives the following examples from Swedish which involve parasitic gaps which are not NPs.

(i)   Till himlen   är det inte säkert att   alla som längtar $\_p$ kommer $\_$.   [E47a]
        To heaven   it is not certain that   everyone who longs $\_p$ get $\_$.

(ii)   Fattig   vill   ingen som någonsin varit $\_p$ bli $\_$ igen.   [E47b]
        Poor   wants   no-one who has ever been $\_p$ to become $\_$ again.

The Pollard and Sag account which treats a parasitic gap as simply a second optional realisation of a standard unbounded dependency is unable to block examples such as those in (45).

A second difference between normal gaps and parasitic gaps is that parasitic gaps cannot be embedded subject gaps even though these are possible with normal extractions. The following examples illustrate:

(46) a.   *Who did you say that John's claiming _$_p$ was his wife would make us believe _ was actually his girlfriend?

       b.   *Who did you say that John's claiming _$_p$ was his wife would make us dislike _.

The pair of examples in (46) demonstrate that an embedded subject parasitic gap is impossible irrespective of whether the real gap is a subject or an object. There would seem to be no way that the HPSG treatment could prevent embedded subject parasitic gaps since after the SLASH path has split higher up in the tree each individual path is a normal SLASH path behaving in a normal way.

Another instance of a position where a normal gap can occur but a parasitic gap cannot, can be found in the parasitic gap example which I first introduced in (28b) in Section 2.3:

(28) a.   I talked to John$_i$ about himself$_i$ [E70]

       b.   *Who did you talk to _ about _$_p$?   [E72]

As I discussed in Section 2.2, Engdahl is able to explain the failure of the parasitic gap in (28b) as contrasting with the well-formedness of (28a). The HPSG theory of parasitic gaps is unable to predict the badness of (28b) and has nothing to say about the way such examples pattern in an opposing way with the anaphora examples. Furthermore, as (47) shows, a normal gap can occur in the position after *about*, and interestingly, in the adjunct in (48), a parasitic gap is also acceptable.

(47)   Who did you talk to Kim about _?

(48)   Who did you betray _ by talking to Kim about _$_p$?

For the Pollard and Sag theory the pattern of data in these examples is hard to explain. In Engdahl's theory based on c-command and in my theory which treats the examples in (47) and (48) by different means, this difference in distribution is easier to account for.

2.4.2   Connectivity

The examples in the previous section showed that the distribution patterns of parasitic gaps and real gaps are far from being the same but there was nothing to question the Pollard and Sag theory that the real gap and the parasitic gap are both realisations of the same

SLASH dependency, i.e. that they are token identical. Pollard and Sag (1994) distinguish two different classes of unbounded dependency, strong UDCs and weak UDCs. In strong UDCs the filler structure-shares its entire LOCAL value with an element in the SLASH set and this ensures connectivity between filler and gap. In weak UDCs the filler and the element in SLASH are only coindexed and so there is no connectivity between the two items. However, irrespective of the nature of the UDC, the Pollard and Sag account predicts connectivity between the real gap and the parasitic gap since they are the same object. This means that in strong UDCs both the real gap and the parasitic gap are predicted to exhibit connectivity with respect to the filler and in weak UDCs there is predicted to be connectivity between the two gaps but not between the gaps and the filler. These predictions are not borne out, as the following examples, taken from Tait (1988), demonstrate:

(49) a.   ?For which crime was Bernard tried _ six months after being charged
                 with _$_p$?

      b.   To whom did Mortimer faithfully continue to write _ after seeing _$_p$
                only once?

These are examples of *wh*-questions (strong UDCs) where the real gap is a PP gap and the parasitic gap is an NP gap—Pollard and Sag wrongly predict these to be ill-formed.

A second problem arising from the strong connectivity prediction concerns the question of whether the real gap and the parasitic gap can differ with respect to case marking. As we saw with the examples in (46) in the previous section, subject parasitic gaps are not possible. However, it is possible for an object parasitic gap to co-occur with an embedded subject real gap as illustrated in (50) ((50b) reproduces (23a) above.)

(50) a.   Who did you say John's criticism of _$_p$ (acc) would make us think
                _ (nom) was stupid?

      b.   Which Caesar did Brutus imply _ (nom) was no good while ostens-   [E60]
                ibly praising _$_p$ (acc)?

There seems no doubt about the well-formedness of these examples but, on the basis of their claim of connectivity between the real gap and the parasitic gap, Pollard and Sag wrongly predict these examples to be bad.[6]

2.5   The C-type/A-type Distinction

In the previous section I showed that there are problems with Pollard and Sag's (1994) treatment of parasitic gaps and I would suggest that many theories of parasitic gaps are not

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[6]In Section 3.4 I develop an account of examples like (50b) which treats them in the same way as ATB extractions from coordinations. This account involves split SLASH paths and is not unlike the Pollard and Sag treatment and so conflicting case is a problem for me too. The crucial difference between the two accounts is that I treat these examples as part of a general theory of conjunction and although I am not able to explain the case conflict, observe that the same pattern occurs in true coordinations:

(i)   Which Caesar did Brutus imply _ (nom) was no good and yet still praise _ (acc)?

satisfactory because they assume that parasitic gaps are a unified phenomenon. The HPSG account uses a split SLASH path to describe the distribution of real gaps and parasitic gaps and this treatment is similar to their use of split SLASH paths to generate across-the-board extractions from coordinations. By contrast, Engdahl's (1983) treatment of parasitic gaps denies that they are related to coordinate gaps and emphasises a connection with the binding theory. In particular, Engdahl shows that configurational notions play a role in parasitic gap constructions: just as a non-pronominal must not be c-commanded by its antecedent, a parasitic gap must not be c-commanded by the real gap. I propose that parasitic gaps be divided into two classes, c-type parasitic gaps and a-type parasitic gaps and that these receive differing analyses. I treat c-type parasitic gaps as a kind of across-the-board gap and a-type parasitic gaps as a kind of empty anaphoric element. The class of c-type parasitic gaps corresponds to the examples I classified as Group 1 and Group 2 in Section 2.1. In this class the parasitic gap occurs to the right of the real gap, inside an adjunct with propositional content. The class of a-type parasitic gaps correspond to Group 3 and Group 4 from Section 2.1. These are ones which occur inside an argument of the same predicate as the constituent containing the real gap.

The divergence of opinion evident in Pollard and Sag's and Engdahl's accounts as to whether a SLASH-based approach or an anaphoric approach is appropriate might be viewed as a reflection of the lack of uniformity across the larger class of parasitic gaps. It seems that the use of SLASH in HPSG is essentially an extension of the analysis of multiple gaps in coordinate structures and lends itself well to the c-type parasitic gaps. On the other hand, the parallels with anaphora are very strong for the class of a-type parasitic gaps and extensions to the binding theory would seem the natural way to account for these. The HPSG approach and Engdahl's approach are in opposition to one another, yet in making the c-type/a-type distinction, I am able to build on the HPSG insights for c-type parasitic gaps and Engdahl's insights for a-type parasitic gaps.

I provide an analysis for c-type parasitic gaps in the next section but it is beyond the scope of this paper to discuss a-type parasitic gaps further. Details of my analysis of a-type parasitic gaps can be found in Grover (1995).

3   Across the Board Extraction

It is generally assumed that parasitic gaps are a unified phenomenon and that the same mechanism can be used to describe both c-type and a-type parasitic gaps. In making the c-type/a-type distinction I have allowed for the possibility that the two classes should be treated separately. In this section I show that there are very strong similarities between c-type parasitic gaps and coordinate structures and for this reason it is appropriate to try to treat c-type parasitic gaps with the same mechanisms as are used for ATB coordinate gaps.

In Section 3.1 I provide evidence for the connection between c-type parasitic gaps and ATB extractions from coordinate structures and I show why a binding theory account like the one I propose for a-type parasitic gaps in Grover (1995) is not appropriate for c-type parasitic gaps. In Section 3.2, I discuss the evidence provided by Bennis and Hoekstra (1985) and Huybregts and van Riemsdijk (1985) which suggests that Dutch has only c-type parasitic gaps and the hypothesis in Huybregts and van Riemsdijk (1985) that Dutch parasitic gaps are the same

as ATB extractions from coordinations. I also examine Williams' (1990) hypothesis that all English parasitic gaps are really ATB gaps. A problem for attempts to treat parasitic gaps as ATB gaps is that they can be optional while the ATB pattern is generally thought to be obligatory. However, there are examples of coordination where the ATB pattern of extraction is violated and I briefly review the discussions of this issue in Goldsmith (1985) and Lakoff (1986). The fact that some extractions from coordinations can be non-ATB points the way to an account which brings coordination and c-type parasitic gaps together. In Section 3.4 I first describe Pollard and Sag's treatment of coordination and then revise it so that the mechanism that is responsible for ATB extractions from coordinations is also used for ATB extractions in c-type parasitic gap constructions. I formulate the account in such a way as to permit non-ATB patterns of extraction in both coordinations and c-type parasitic gap constructions.

3.1   C-Type Parasitic Gaps

Engdahl gives several reasons why she feels that parasitic gaps must be distinguished from the ATB gaps that occur in coordinate structures. These reasons are shown in (51):

(51) a.   Examples where the two gaps occur in arguments of the same pre-
             dicate, i.e. the examples in Groups 3 and 4 in Section 2.1, cannot be
             analysed as conjoined structures.

      b.   The 'conjuncts' would not be of the same syntactic category and
             semantically they would be of different types.

      c.   Parasitic gaps are optional whereas the ATB restriction on extractions
             from coordinations ensure that it is obligatory for a gap to occur in
             each conjunct.

Assuming the division described above between c-type parasitic gaps and a-type parasitic gaps, Engdahl's first point about certain examples not being analysable as coordinations simply follows from the reclassification. Engdahl's next assumption, that conjuncts must be syntactically and semantically similar, while an impediment to an analysis of c-type parasitic gaps as coordinate, is not conclusive—in the next section I review some attempts to provide a coordinate analysis of c-type parasitic gaps. Although it is possible to treat c-type parasitic gap structures as coordinate, in my own analysis I do not take this step since I prefer to widen the domain in which ATB extraction can occur. So long as c-type parasitic gap structures are analysed as being similar in some respects to coordinate structures then an ATB mode of extraction can be extended to them too. Moreover, on the semantic front, the c-type parasitic gap example and the coordination in (52) and (53) seem to me to be very close in meaning: while *without* is thought of as a subordinating conjunction it seems clear that at least in these kinds of examples it means the same as *and not*.

(52)   Which book did Kim [file _] without [reading _]?

(53)   Which book did Kim [file _] and [not read _]?

Engdahl's third reason for not treating parasitic gaps as coordinate gaps is that parasitic gaps are optional while ATB extractions from coordinate structures are obligatory. However, there

are examples of coordination where a non-ATB extraction is acceptable. (54) and (55) contain examples of coordinations where only one conjunct contains a gap.

(54) a.   Who did the old man die and leave money to _?

      b.   Who did you go to lunch and forget to invite _?

(55) a.   What kind of dessert can you eat a lot of _ and not gain weight?

      b.   How many hours can you work _ and still have a social life?

Notice the similarity between the examples in (54) and (55) and the possibility of single gaps in the kind of structures involved in c-type parasitic gaps (the examples in (56) are from Pollard and Sag (1994)):

(56) a.   Those boring old reports, Kim went to lunch without reading _.

      b.   That's the symphony that Schubert died without finishing _.

      c.   How many of the book reports did the teacher smile after reading _.

(57) a.   What kind of dessert can you eat a lot of _ without gaining weight?

      b.   How many hours can you work _ before you've no social life?

In Section 3.3 I discuss examples like (54) and (55) in more detail.

In the remainder of this section I present some further similarities between c-type parasitic gaps and coordinations which lend support to the distinction between c-type and a-type parasitic gaps. One such similarity concerns the possibility of rightward extraction. In most parasitic gap examples, the real gap is leftward-extracted—the examples tend to involve *wh*-questions, topicalisations or relative clauses. There are, however, some examples of rightward extractions that Engdahl cites as suggested by Wasow:

(58)   John offended _ by not recognising _ immediately, his favourite uncle   [E26]
         from Cleveland.

(59)   Susan always files _ without reading _ properly, all the memos from   [E27]
         the lowlevel administration.

Interestingly these examples occur only with the c-type examples and feel very much like examples of Right Node Raising (RNR), a rightward extraction which occurs almost exclusively with coordinate structures. Attempts to produce rightward extractions with a-type parasitic gaps do not yield good results:

(60)   *I persuaded the students of _ to nominate _ for the award, that
         distinguished professor of physics.

(61)   *I persuaded _ to invite us to visit _, those students that you've
          been wanting to meet.

Another way in which the c-type parasitic gaps resemble coordination is in the sharing of control/agreement properties between the two 'conjuncts'. When two VPs are coordinated they must share a subject and in the *without*-type examples that we have been looking at, this is also the case: the person who does the filing is also the person who fails to do the reading. Even in cases where the adjunct contains a full finite sentence, if the subjects are coreferential then a parasitic gap is far more acceptable:

(62) a.   This is the only report that Sue actually read _ before she filed _.

     b.   ??This is the only report that Sue actually read _ before John filed _.

     c.   This is the only report that Sue actually read _ before she/John filed it.

Another point for consideration which also seems to suggest a connection with coordination for the c-type parasitic gaps, concerns comparative constructions. It has occasionally been noted that comparative constructions share certain properties with coordinate constructions, see for example Napoli (1983). Evidence for this view comes (among other things) from the fact that gapping and RNR are possible only with coordination and comparatives. The following examples are taken from Napoli:

(63) a.   Mary loves Fellini more than John, Bertolucci.   (gapping)

     b.   I organise more than I actually run her life.   (RNR)

Consider again the example of a c-type parasitic gap which I gave in (6) in Section 2.1 (which originated with Ross (1967) and was reproduced by Engdahl):

(6)   ?The blintzes which Sasha is gobbling _ down faster than I can
          reheat $_p$ are extremely tasty, if I do say so.   [E11]

If we add to this a rightward-moved version as in (64), it should become apparent that if comparative formation is like coordination then the extractions in (6) and (64) are just as likely to be ATB extractions as instances of a real gap/parasitic gap pair.

(64)   Sasha is gobbling _ down faster than I can reheat _, those extremely tasty blintzes.

Further to the topic of gapping, moreover, Napoli provides the following example of gapping in a *without*-adjunct.

(65)   John's putting out his cigarette without Mary hers didn't help at all.

Although I find this example questionable, Napoli claims it is acceptable. The point of this example is that in order for gapping to occur, the construction has to be classified at some level as similar to coordination and this in turn lends support to the idea that a parasitic gap in a *without*-phrase is actually an ATB gap.

Further to the discussion of comparatives, the following examples involving pseudo-gapping and VP-ellipsis also seem to provide evidence that coordinate structures, structures containing *without* adjuncts and comparatives are syntactically very similar:

(66) a.   John ate the beans and Bill did the peas.

       b.   John ate the beans before Bill did the peas.

       c.   John ate more beans than Bill did peas.

(67) a.   John ate the beans and then Bill did.

       b.   John ate the beans before Bill did.

       c.   John ate more beans than Bill did.

An alternative way of motivating an ATB extraction approach to c-type parasitic gaps is to consider whether they can be treated in the same way as a-type parasitic gaps. If they can be straightforwardly analysed using the same mechanism as used for a-type parasitic gaps then this would weaken the case for the a-type/c-type distinction. In Grover (1995) I propose a binding theory account of a-type parasitic gaps which, following Pollard and Sag, defines binding relations in terms of o-command. If that analysis were to be extended to c-type parasitic gaps the condition that a parasitic gap must not be o-commanded by the real gap would easily be met since it is always the case that c-type parasitic gaps and the real gaps they occur with are mutually non-o-commanding. The reason for this follows from the fact that in c-type parasitic gap examples, the parasitic gap occurs inside an adjunct. Since adjuncts are not subcategorised by the elements they combine with, they never appear on a SUBCAT list and hence the elements inside them never enter into o-command relations with elements outside them. This means, however, that any coindexing of the c-type parasitic gap with an antecedent is not within the domain of the binding theory and it would possibly be more difficult to require that a c-type parasitic gap should have an appropriate antecedent.

There would also be a problem with a binding theory treatment stemming from the use of o-command rather than c-command. As I explained in Section 2.2, Engdahl treats the difference between (68a) and (68b) as following from differences in c-command.

(68) a.   Which Caesar did Brutus imply __ was no good while ostensibly praising __$_p$?

       b.   *Which articles did you say __ got filed by John without him reading __$_p$?

For a binding theory that relies on o-command, there is no difference between (68a) and (68b) and so an attempt to treat c-type parasitic gaps as anaphors will wrongly predict (68b) to be well-formed.

There is another set of data, that throws some more doubt on a binding theory approach to c-type parasitic gaps and this relates to how normal pronouns and NPs distribute in the relevant positions. Consider the a-type parasitic gap examples in (69a) and (70a): as (69b&c) and (70b&c) show, we can replace the two gaps by a coindexed pair of referential NP and pronoun in either order. By contrast, the two gaps in the c-type parasitic gap examples in (71) and (72) can only be replaced by a similar pair if the full NP precedes the pronoun.

(69) a.   Who did John's spreading rumours about $\_p$ annoy $\_$?

b.   John's spreading rumours about Max$_i$ annoyed him$_i$.

c.   John's spreading rumours about him$_i$ annoyed Max$_i$.

(70) a.   Which sick student did John persuade friends of $\_p$ to visit $\_$?

b.   John persuaded friends of the sick student$_i$ to visit him$_i$.

c.   John persuaded friends of his$_i$ to visit the sick student$_i$.

(71) a.   Which report did John file $\_$ without reading $\_p$?

b.   John filed that report$_i$ without reading it$_i$.

c.   *John filed it$_i$ without reading that report$_i$.

(72) a.   Who did John offend $\_$ by not recognising $\_p$?

b.   John offended Maria$_i$ by not recognising her$_i$.

c.   *John offended her$_i$ by not recognising Maria$_i$.

Whatever the reasons for this difference, coordinate structures behave in the same way as the c-type parasitic gaps, as illustrated in (73) and (74):

(73) a.   What did John read $\_$ and file $\_$?

b.   John read the report$_i$ and filed it$_i$.

c.   *John read it$_i$ and filed the report$_i$.

(74) a.   What did John cook $\_$ and then forget to eat $\_$?

b.   John cooked the food$_i$ and then forgot to eat it$_i$.

c.   *John cooked it$_i$ then forgot to eat the food$_i$.

I hope to have shown here that there is a strong case for treating c-type parasitic gaps using the same means as for coordinate gaps and for treating them differently from a-type parasitic gaps. In the next section, I review some accounts which seek to treat parasitic gaps within a theory of coordination.

3.2 ATB Accounts of Parasitic Gaps

3.2.1 Dutch

The distribution of parasitic gaps in Dutch is much more limited than in English. Dutch appears not to permit any parasitic gaps of the kind I have classified as a-type. Bennis and Hoekstra (1985) argue that difficulties in constructing Dutch parasitic gaps follow from the stronger restrictions that Dutch imposes on preposition stranding and extractions from sentential complements. Many of the English a-type parasitic gaps occur as objects of prepositions and, according to Bennis and Hoekstra, Dutch counterparts are impossible because Dutch prepositions cannot be stranded in this way. Similarly, it is more difficult to extract out of sentential complements in Dutch than it is English and this limits the possibilities still further. In short, it seems that the only well-formed parasitic gaps in Dutch are ones which I would classify as c-type. Bennis and Hoekstra subscribe to the prevailing view that all parasitic gaps must be treated alike and this is why they need to offer an explanation of the fact that Dutch doesn't have the same range of parasitic gaps as English. Since I propose that a-type and c-type parasitic gaps are separate phenomena, it follows that it should be possible for a language to have one or the other, or both, or neither. So for me, it is sufficient to say that Dutch does not have a-type parasitic gaps.

Many Dutch c-type parasitic gaps are quite straightforward equivalents of English examples. The following are taken from Bennis and Hoekstra (1985):

(75) a.   Welke boeken   heb je   zonder $\_p$ te bestuderen $\_$ weggebracht?
          Which books   have you   without $\_p$ to study $\_$ away brought
          'Which books did you bring away without studying?'

   b.   Dit is die oom   die ik   na jaren niet $\_p$ gezien te hebben
        This is the uncle that I   after years not $\_p$ seen to have
        gisteren $\_$ weer ontmoette.
        yesterday $\_$ again met.
        'This is the uncle that I met again yesterday after not having seen for years'

Bennis and Hoekstra (1985) and Huybregts and van Riemsdijk (1985) discuss some interesting examples where a parasitic gap appears not to be dependent on another gap:

(76)   Hij heeft   deze artikelen   zonder $\_p$ te lezen   opgeborgen.
       He has   these articles   without $\_p$ to read   filed.
       'He filed these articles without reading them.'

Here the adjunct introduced by *zonder* intervenes between the verb *opgeborgen* and its direct object *deze artikelen*. Since the direct object has not been extracted it is strange that a parasitic gap should be able to occur. Bennis and Hoekstra suggest that the direct object has, in fact, moved from its position immediately to the left of the verb to a position where it precedes the entire VP and this means that there is actually a real gap for the parasitic gap to depend on:

(77)   Hij heeft   deze artikelen   zonder $\_p$ te lezen $\_$ opgeborgen.
       He has   these articles   without $\_p$ to read $\_$ filed.
       'He filed these articles without reading them.'

This would mean that the gap after *zonder* can be thought of as a parasitic gap but it is still not clear that the real gap is a real trace resulting from *wh*-movement and in turn this throws some doubt on the standard claim that parasitic gaps can only be licensed by traces. Bennis and Hoekstra argue that the object is adjoined to the VP in a position which is an $\overline{\mathrm{A}}$ position and that therefore the real gap is a trace. They liken this extraction to Complex NP Shift except that the NP moves to the left not to the right. Huybregts and van Riemsdijk (1985) find that there is evidence both for and against the claim that the object's position is an $\overline{\mathrm{A}}$ position. They contrast examples like (77) with examples which are similar except that they are coordinate, as in (78). Here the presence of two gaps is best described as resulting from an ATB extraction.

(78)   Hij heeft   deze artikelen   zowel $\_p$ gelezen   als $\_$ opgeborgen.
       He has   these articles   both $\_p$ read   and $\_$ filed.
       'He both read and filed these articles.'

Given the similarity of the examples, Huybregts and van Riemsdijk hypothesise that Dutch parasitic gaps are in fact not parasitic gaps but are really the result of ATB extractions from coordinate structures. They term the process by which the NP in examples like (77) and (78) moves leftwards out of both conjuncts Left Node Raising, which they claim to be the mirror image of Right Node Raising.

Huybregts and van Riemsdijk provide further evidence for the coordination account of Dutch parasitic gaps which is specific to Dutch and which I need not reproduce here. The point I would like to make is that Dutch only has c-type parasitic gaps and that Dutch linguists have considered that these may not be true parasitic gaps but coordinate gaps instead. I consider that this lends weight to my treatment of c-type parasitic gaps in English.

In their analysis of Dutch parasitic gaps, Huybregts and van Riemsdijk have to reconcile the fact that ATB extractions are generally obligatory with the fact that parasitic gaps are optional and can be replaced by pronouns. They do this by hypothesising that conjunctions like *zonder* are fundamentally subordinating conjunctions but that they can be forced into a coordinating role. In (79) the presence of the pronoun in the adjunct indicates that *zonder* is behaving as a subordinating conjunction while in (75) the presence of the parasitic gap indicates that it is behaving as a coordinating conjunction.

(79)   Welke boeken   heb je   zonder ze te bestuderen $\_$ weggebracht?
       Which books   have you   without them to study $\_$ away brought?
       'Which books did you bring away without studying them?'

This seems like a plausible analysis for examples involving extraction as in (75) and (77) but it is not clear how Huybregts and van Riemsdijk would deal with examples like (80) and (81) where there are no gaps:

(80)   Je hebt   zonder ze te bestuderen   deze boeken   weggebracht.
        You have   without them to study   these books   away brought.
        'You brought these books away without studying them.'

(81)   Je hebt   deze boeken   weggebracht   zonder ze te bestuderen.
        You have   these books   away brought   without them to study.
        'You brought these books away without studying them.'

Here the problem is that these examples would be ambiguous between an analysis where *zonder* was a subordinating conjunction and one where it was a coordinating conjunction. I assume that Huybregts and van Riemsdijk intend that *zonder* should only be a coordinating conjunction in cases where the ATB pattern of extraction requires this analysis but it is hard to see how this can be built into a grammar.

3.2.2   Williams' Account

Williams (1990) presents an account of English parasitic gaps where he attempts to reclassify parasitic gaps as ATB gaps in coordinate structures. His account is therefore similar to Huybregts and van Riemsdijk's but he has to account for a far wider range of data than they do because English has a-type as well as c-type parasitic gaps. In order to treat all parasitic gaps as ATB gaps Williams has to loosen the definition of coordination quite considerably so as to achieve the kinds of analyses indicated in (82):

(82) a.   Who would you [warn _] COORD [before striking _$_p$]?

      b.   Which stars do [pictures of _$_p$] COORD [annoy _]?

      c.   Who did you promise [friends of _$_p$] COORD [to try to find _]?

A general feature of coordinate structures is that the conjuncts are identical (with the usual provisos) and that the element combining them is a conjunction. (82a) can plausibly be fitted into this model because the two conjuncts are at least analysable as being of the same syntactic category, and because *before* is a conjunction, albeit a subordinating one. The hypothesised conjuncts in (82b) and (82c), on the other hand, are syntactically and semantically dissimilar and there is no overt element which is obviously a conjunction. For (82b), Williams suggests that the conjunction is INFL and for (82c) he suggests it is the verb *promise*.

Williams provides a table of possible coordinations that give rise to parasitic gaps through ATB extraction and grades them in order of acceptability, as follows:

(83)   Who did you meet _ and dislike _   and: S S
          What did you file _ before reading _   before: S S
          The man who people who meet _ like _   the: S S
          Who would pictures of _ upset _   INFL: NP VP
          Who did you promise friends of _ to try to find _   V: NP S

He suggests that the acceptability ranking follows from the fact that this ranking also mirrors "COORDinatability": the less coordinate-like an example is, the less acceptable it is. Furthermore, he speculates that differences between languages may reflect the grading and that Dutch only permits the top of the list whereas English is more liberal.

Postal (1993) criticises Williams' account in both general and specific terms. On a general level he finds the relaxed notion of coordination rather unpalatable especially since Williams' description is too informal and schematic to be properly assessed. I agree with this criticism but because I make a sharp distinction between a-type and c-type parasitic gaps I can escape from the 'all or nothing' attitude that is the basis for their disagreement. Because Williams believes that parasitic gaps are a unified phenomenon, he is forced to apply to a-type parasitic gaps an analysis which is only plausible for c-type parasitic gaps. And because Postal also believes that parasitic gaps are a unified phenomenon, when he rejects Williams' analysis as being implausible for a-type parasitic gaps he is also forced to reject it for c-type parasitic gaps.[7] I am broadly in agreement with Williams' analysis (and that of Huybregts and van Riemsdijk 1985) for the class of c-type parasitic gaps but reject it for a-type parasitic gaps. Moreover, I do not have to appeal to a notion of relative coordinatability to account for why Dutch only has a subset of the parasitic gaps that English has: in my view both have c-type parasitic gaps but only English has a-type parasitic gaps.

Like Huybregts and van Riemsdijk, Williams must deal with the fact that c-type parasitic gaps are optional. He considers the following set of examples:

(84) a.   Which boy would you warn _ before striking _?

      b.   Which boy would you warn _ before striking him?

      c.   Which boy would you warn Mary before striking _?

(84a) exhibits an ATB pattern of extraction and must therefore involve a coordinate structure but since (84b) and (84c) involve only single gaps, Williams suggests that they are not coordinate. Presumably (84b) is straightforwardly generated as a standard extraction but (84c) needs extra explanation since extractions from adjuncts are normally disallowed. Williams solution is to suggest that an adjunct has to be demoted to a position inside the VP in order for extraction to be possible. As evidence for this analysis he offers the example in (85):

(85)   *Which boy$_i$ would you warn him$_i$ before striking _$_i$?

If the adjunct was in its normal position, then there would be no reason to reject (85) since the pronoun does not c-command the gap (an R-expression) but if, as Williams has suggested, the presence of the gap implies that the adjunct has been demoted into the VP then (85) is predicted to be ill-formed because the pronoun does c-command the gap and this violates Principle C of the binding theory.

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[7] In fact Postal does not believe that all apparent parasitic gaps really are parasitic gaps: in Postal (1994) he distinguishes a class of true parasitic gaps from a class of gaps which look like parasitic gaps but which are not. The ones which are not are ones arising from rightward extractions and he claims these are instances of ATB extractions. Thus he finds himself denying Williams' claim that all parasitic gaps are ATB gaps but agreeing with him that some are.

While I favour Williams's treatment of c-type parasitic gaps on a broad level, it seems to me that his account suffers from the same problem of spurious ambiguity as that of Huybregts and van Riemsdijk. When there is an extraction involved in these kinds of structures then the pattern of gaps determines whether the structure is coordinate or not, and if not, whether the adjunct has been demoted or not. However, if there is no extraction then either the examples are ambiguous between a coordinate and a non-coordinate analysis (and if non-coordinate, between a demoted and a non-demoted analysis) or Williams must require the grammar to prefer the non-coordinate, non-demoted analysis and to only look for the other kind if forced to. This latter option seems to me to be at odds with a declarative specification of grammar and so either eventuality is undesirable. In Section 3.4 I develop an HPSG analysis of c-type parasitic gaps which owes much to Williams' insights but which does not suffer from this particular defect.

3.3   Coordination and ATB

In the previous section I discussed Huybregts and van Riemsdijk (1985) and Williams (1990) and showed that for both accounts the fact that c-type parasitic gaps are optional leads to a conclusion that these constructions are thought to be coordinate only when there is an ATB pattern of extraction, and subordinate otherwise. This conclusion follows from two assumptions: (i) that the ATB pattern of extraction occurs exclusively in coordinate structures and (ii) that the ATB pattern is obligatory in coordinate structures. From (i) it follows that when ATB gaps occur in c-type structures then the structure must be coordinate and from (ii) it follows that when the ATB pattern does not occur then the structure cannot be coordinate. In the case when there are no extractions it is impossible to tell whether the structure is coordinate or subordinate. As I have already suggested, I find it rather unsatisfactory to claim that this type of construction is sometimes subordinate and sometimes coordinate and in what follows I will seek to provide an account where the structures in which c-type parasitic gaps occur are unequivocally subordinate irrespective of extractions. At the same time I do wish to claim that c-type parasitic gaps result from an ATB method of extraction and in order to do this I must give up both of the assumptions in (i) and (ii) above.

In giving up the second assumption, that the ATB pattern of extraction is obligatory in coordinate structures, I am assisted by the fact that the assumption is simply not true. In (54) and (55) above, I gave examples of single extractions from the rightmost conjunct and the leftmost conjunct respectively. Examples such as (55) are discussed by Goldsmith (1985) and the following are further examples taken from that paper.

(86) a.   How many courses can we expect our graduate students to teach __
              and (still) finish a dissertation on time?

      b.   How much can you drink __ and not end up with a hangover the next
              morning?

      c.   How many counterexamples can the Coordinate Structure Constraint
              sustain __ and still be considered empirically correct?

Goldsmith observes that in examples such as these, the meaning of the conjunction *and* can be paraphrased as *and nonetheless* and that this meaning is distinct from its more standard

meaning. He identifies four distinct kinds of relationship that can hold between coordinated VPs as illustrated by the four examples in (87).

(87) a.   Our first contestant likes to play the piano and (to) learn exotic languages.

b.   Harry is the only one who can hear a song once and play it perfectly on the piano.

c.   The child heard the news and broke down in tears.

d.   Jones went over the rapids and lived to tell the tale of it.

Goldsmith describes these in turn as truth-conditional *and*, temporal *and*, causal *and* and the *despite* or *nonetheless* use of *and*. It is only in the fourth type of example that it is possible to extract out of the first conjunct only. From this it is clear that the precondition for the violation of the ATB pattern of extraction is a semantic one rather than a syntactic one but nevertheless it is necessary to describe how a semantic difference affects syntactic behaviour. Goldsmith's solution to the problem is to suggest that in its *despite* usage *and* is syntactically a subordinator rather than a coordinator. He suggests that the structure involved in the examples in (86) and (87d) is one where the *and* constituent attaches as a VP adjunct. Thus, in spite of the fact that his examples appear to be exceptions to the ATB condition, Goldsmith manages to retain assumptions (i) and (ii) above, by reanalysing the problematic examples as subordination rather than coordination. If his examples are not coordinations then the ATB pattern is not to be expected and has not been violated and Ross's (1967) original formulation of the Coordinate Structure Constraint can be retained.

I criticised Huybregts and van Riemsdijk's and Williams' reanalysis of subordination as coordination in the previous section and similarly Goldsmith's reanalysis of coordination as subordination is not without problems. Lakoff (1986) discusses Goldsmith's data and the other kind of example of non-ATB extraction where it is the final conjunct that contains the gap. (54) contains some examples and the following are taken from Lakoff:

(88) a.   What did Harry go to the store and buy _?

b.   Sam is not the sort of guy you can just sit there and listen to _.

Lakoff discusses Goldsmith's reanalysis and he also discusses the possibility of reanalysing the *and* conjunct in (54) and (88) as a kind of purpose adjunct. In both cases, however, he rejects reanalysis since he shows that syntactically these constructions must be coordinations. He demonstrates this with the examples in (89) which show first that multiple conjuncts are possible and second that a variable number of conjuncts can be extracted from.

(89) a.   What did he go to the store, buy _, load _ in his car, drive home, and unload _?

b.   How many courses can you take _ for credit, still remain sane, and get all A's in _?

Lakoff argues that examples such as these can only be coordinations since multiple gaps of this kind can only occur in coordinate structures. Furthermore, since the extraction is not from all conjuncts, Lakoff concludes that the Coordinate Structure Constraint is not a purely syntactic constraint. Lakoff proposes that any analysis of extractions from coordinations must be one where patterns of extraction are dependent on semantic properties of the conjuncts and of the relationship that holds between them. He characterises the examples in (88) and (89a) as involving a "Type A scenario" where a sequence of events fits normal conventionalised expectations. In these cases the final conjunct must contain a gap but the other conjuncts need not. Goldsmith's examples in (86) and the example in (89b) are ones involving a "Type B scenario" where the course of events is counter to conventionalised expectations. In these cases the final conjunct need not contain a gap. A third scenario type which also allows non-ATB extraction is "Type C" where there is a causative relation between the conjuncts, as illustrated in (90).

(90)   a.   That's the stuff that the guys in the Caucasus drink _ and live to be a hundred.

b.   That's the kind of firecracker that I set off _ and scared the neighbours.

Details of the semantic side of Lakoff's analysis need not concern us here, but it is instructive to consider his paper since his basic points do seem to be correct. In particular, I agree with Lakoff that the structures in his and Goldsmith's examples are truly coordinate not subordinate and I agree that it follows that patterns of extraction should be made to be dependent on semantic factors. In the next section I propose a revised version of Pollard and Sag's treatment of coordination which permits non-ATB patterns of extraction in non-symmetric coordinate structures. The possibility of ATB extraction is described as pertaining not just to coordinate structures but also to the wider class of conjunctive structures. In this way I am able to use the same mechanism to describe extraction in both coordinate structures and the subordinate structures in which c-type parasitic gaps occur. Moreover the mechanism can be made sensitive to semantic properties of the construction and non-ATB extraction may occur depending on certain semantic conditions.

3.4   ATB Extraction in HPSG

Pollard and Sag (1994) do not treat coordination in any great detail but the general shape of their analysis has its roots in the GPSG account of coordination, as described in Gazdar *et al.* (1985) and Sag *et al.* (1985). One of the strengths of the GPSG analysis was its account of the Coordinate Structure Constraint and ATB exceptions to it. GPSG was able to ensure the ATB pattern of extraction because coordinate structures were multiply-headed (i.e. each conjunct was marked as a head) and because SLASH was both a FOOT feature and a HEAD feature. From the Foot Feature Principle it followed that any SLASH value on a daughter was also on the mother and from the Head Feature Convention it followed that any SLASH value on the mother was also on all the conjuncts. For GPSG, parasitic gaps arose in much the same way except that the structures in which they occurred had a single head and while the mother could share a SLASH value with more than one daughter, it was only required to share it with the head. As a result the following patterns were predicted (where H indicates the head):

(91) a.   What did you [ʜ[file _] ʜ[and read _]] ?

      b.   *What did you [ʜ[file _] ʜ[and read it]] ?

      c.   *What did you [ʜ[file it] ʜ[and read _]] ?

(92) a.   What did you [ʜ[file _] [without reading _]] ?

      b.   What did you [ʜ[file _] [without reading it]] ?

      c.   *What did you [ʜ[file it] [without reading _]] ?

In Pollard and Sag (1994), SLASH is not a head feature and coordinate structures are assumed to be unheaded, so the GPSG account is not easily incorporated. Instead, the account of how parasitic gaps arise is separated out from the account of how ATB coordinate gaps arise: the Nonlocal Feature Principle is responsible for parasitic gaps but the Coordination Principle is responsible for ATB coordinate gaps. I reproduce the Nonlocal Feature Principle in (93).

(93)   NONLOCAL FEATURE PRINCIPLE

             In a headed phrase, for each nonlocal feature F = SLASH, QUE,
             or REL, the value of SYNSEM|NONLOCAL|INHERITED|F is the set
             difference of the union of the values on all the daughters and the
             value of SYNSEM|NONLOCAL|TO-BIND|F on the HEAD-DAUGHTER.

This definition only affects headed phrases (i.e. non-coordinate phrases). It permits an element in a mother's SLASH set to propagate to more than one daughter and, when the SLASH path splits in this way, we get parasitic gaps.

Pollard and Sag do not attempt to describe coordinate structures in any detail. In their Chapter 9 they provide a classification of headed structures but no description of the class of unheaded structures. It is not possible for me to articulate a precise theory of coordination here but I will assume that the structures that GPSG assigns to coordinations are essentially correct, modulo their assumption that conjuncts are heads. In particular, I follow the GPSG treatment of conjunctions whereby they form constituents with the conjuncts to their right. Since coordinate structures are unheaded, the Nonlocal Feature Principle does not apply and a Coordination Principle is required to permit split SLASH paths in coordinate structures. Pollard and Sag define the Coordination Principle as follows:[8]

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[8] Pollard and Sag also consider and reject a stronger version of the principle as follows:

    COORDINATION PRINCIPLE (strong version)
    In a coordinate structure, the CATEGORY and NONLOCAL value
    of each conjunct daughter is identical to that of the mother.

Both the weak and the strong version ensure an ATB pattern of extraction but the strong version is overly restrictive—in forcing identity between the mother and the conjuncts it fails to capture an insight which was a significant part of the GPSG approach, namely that the conjuncts have to share with their mother only as much information as the context imposes on the mother. Some contexts place relatively few constraints on particular categories and in these contexts the mother is underspecified and the conjuncts may differ quite radically. For example, (i) shows a coordination of an NP and an AP which is well-formed because *be* can take predicative complements of any syntactic category.

(94)   COORDINATION PRINCIPLE (weak version)

In a coordinate structure, the CATEGORY and NONLOCAL value of each conjunct daughter is subsumed by (is an extension of) that of the mother.

The Coordination Principle ensures that only an ATB pattern of extraction is possible in coordinate structures. The HPSG treatment of the differences between c-type parasitic gaps and ATB extractions from coordinate structures can be seen in the following two trees.[9]

(95)

```
                          S
                   [ INHER | SLASH  { } ]
                  /                      \
           [1] NP                         S
              /\                  [ INHER | SLASH  { [1] } ]
         which book              /         |          \
                               V          NP           VP
                               |          |      [ INHER | SLASH  { [1] } ]
                              did         Kim        /              \
                                        VP (nonhead)            VP (nonhead)
                                  [ INHER | SLASH { [1] } ]   [ INHER | SLASH { [1] } ]
                                          |                      /        \
                                          V                    CC         VP
                                          |                    |    [ INHER | SLASH { [1] } ]
                                         file                 and          |
                                                                           V
                                                                           |
                                                                          read
```
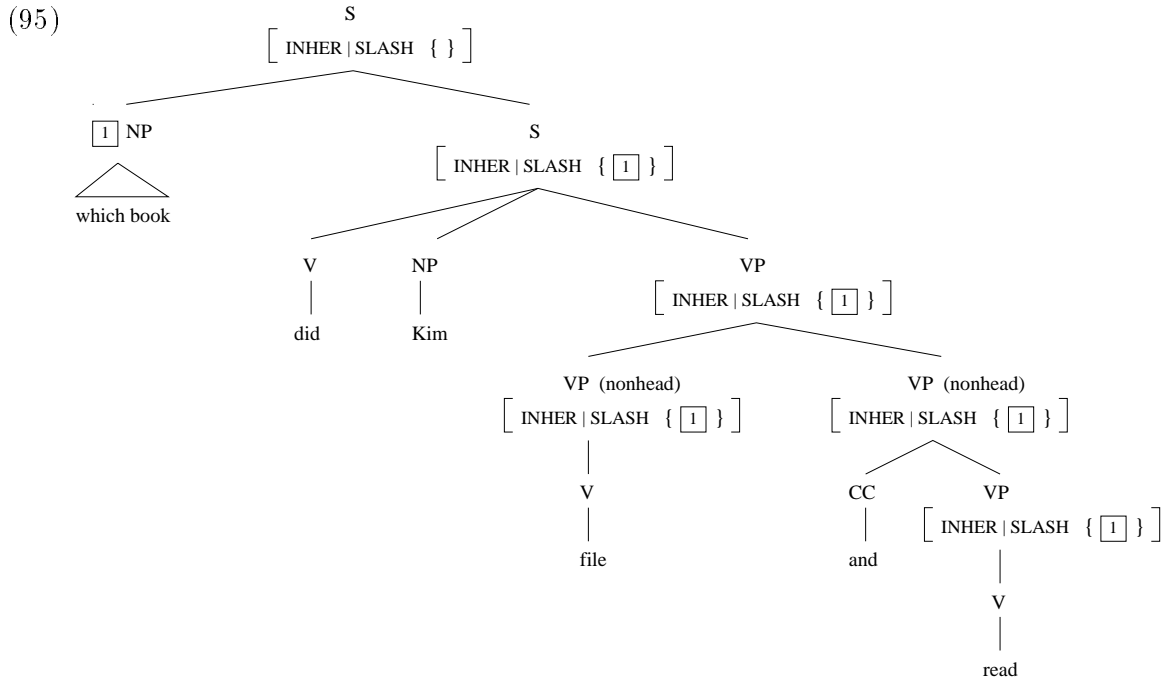
(i)   Francis is a doctor but not happy in his choice of career.

In examples like these the mother node is a partially specified category and, as Pollard and Sag note, this raises questions of a foundational nature for HPSG: elsewhere in the theory linguistic objects are taken to be completely specified objects in the sense that every feature appropriate for a particular entity is specified but with the weak version of the Coordination Principle, the mother node of a coordination is a partially specified entity. This raises the question of whether linguistic entities can be inherently partial. Pollard and Sag leave this as an unresolved issue and I follow their lead.

[9] For simplicity, I have omitted the TO-BIND|SLASH values.

(96)

```
                            S
                   ┌                    ┐
                   │ INHER | SLASH  { } │
                   └                    ┘
           ┌───────────────────┴─────────────────────┐
        ┌─┐                                            S
        │1│ NP                               ┌                      ┐
        └─┘                                  │ INHER | SLASH  { ┌─┐ }│
          ╱╲                                 │               └─┘  │
         ╱──╲                                └                      ┘
        which book              ┌───────────┬──────────────────────┐
                                V           NP                      VP
                                │           │            ┌                      ┐
                                did         Kim          │ INHER | SLASH  { ┌─┐ }│
                                                         │                 └─┘  │
                                                         └                      ┘
                                           ┌──────────────────┴─────────────────────┐
                                   VP  (head)                                PP  (adjunct)
                          ┌                      ┐                  ┌                      ┐
                          │ INHER | SLASH  { ┌─┐ }│                 │ INHER | SLASH  { ┌─┐ }│
                          │                 └─┘  │                  │                 └─┘  │
                          └                      ┘                  └                      ┘
                                   │                                   ┌──────────┴──────────┐
                                   V                                   P                     VP
                                   │                                   │          ┌                      ┐
                                   file                                without     │ INHER | SLASH  { ┌─┐ }│
                                                                                  │                 └─┘  │
                                                                                  └                      ┘
                                                                                              │
                                                                                              V
                                                                                              │
                                                                                           reading
```
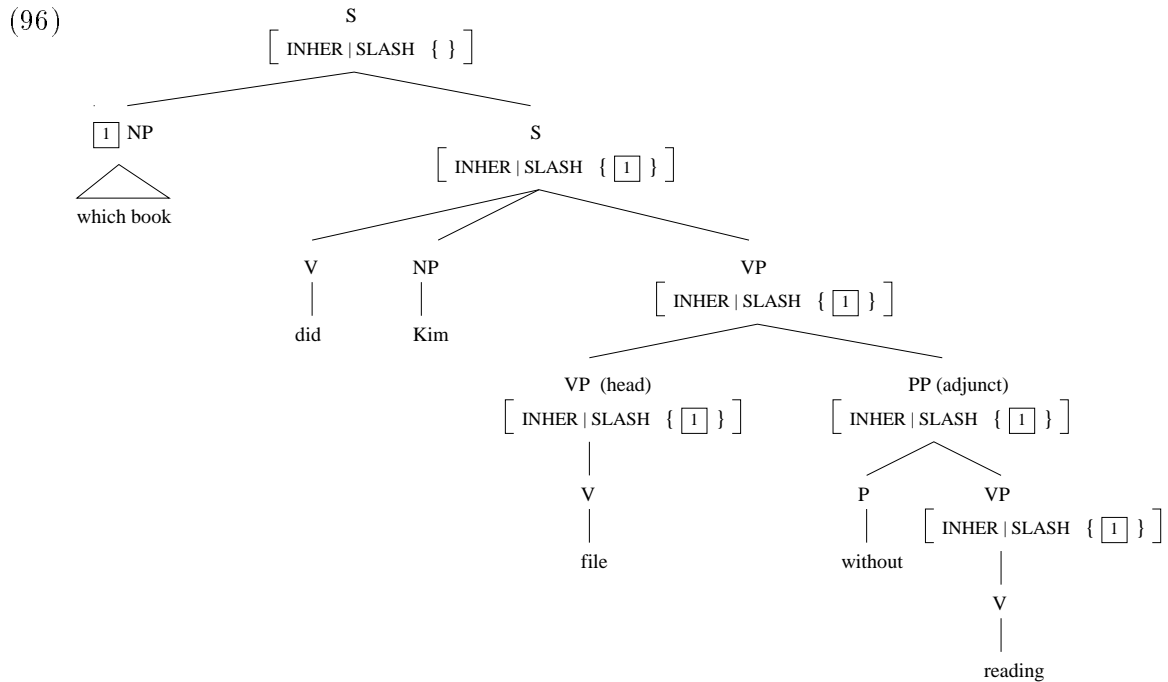
Both trees contain a larger VP: in (95) this is a coordinate VP and in (96) it is a head-adjunct structure. I will refer to this second kind of larger VP as a c-type VP in what follows. In both of the trees the SLASH path splits at the top node of the larger VP and propagates to both daughters. In (95) this split is licensed by the Coordination Principle and in (96) it is licensed by the Nonlocal Feature Principle.

In my analysis of parasitic gaps I have argued that a-type parasitic gaps are anaphors, not gaps, and I have argued that c-type parasitic gaps arise from the same mechanism that underlies extractions from coordinations. In this view of the world, ATB patterns of extraction arising from split SLASH paths are only permitted in coordinate structures and in c-type VPs. In order to formalise my analysis, I must revise Pollard and Sag's account. The first step in this revision is to ensure that split SLASH paths cannot ordinarily occur. The second step is to widen the usual assumptions about the structures in which split SLASH paths can occur—I will define a class of conjunctive structures which includes coordinate and subordinate structures. The third step is to replace Pollard and Sag's Coordination Principle with a Conjunction Principle which will not only permit ATB extractions in conjunctive structures but will also allow non-ATB extractions under certain semantically determined conditions.

To achieve the first step of preventing split SLASH paths from arising in non-coordinate structures, I modify the Nonlocal Feature Principle as follows:

(97)   NONLOCAL FEATURE PRINCIPLE (revised)

In a non-conjunctive headed phrase, for each nonlocal feature
F = SLASH, QUE or REL, the value of SYNSEM|NONLOCAL|INHERITED|F
is the set difference of the disjoint union of the values on all the
daughters and the value of SYNSEM|NONLOCAL|TO-BIND|F on the
HEAD-DAUGHTER.

The major difference between this and Pollard and Sag's version is the use of disjoint union (⊎) instead of set union (∪).[10] Disjoint union is just like set union except that its arguments must be disjoint sets.[11] The following table illustrates the behaviour of the two operations.

$$(98) \quad
\begin{array}{rclcl}
\{\,\} & \cup & \{\,\} & = & \{\,\} \\
\{\boxed{1}\} & \cup & \{\,\} & = & \{\boxed{1}\} \\
\{\boxed{1}\} & \cup & \{\boxed{1}\} & = & \{\boxed{1}\} \\
\{\boxed{1}\} & \cup & \{\boxed{2}\} & = & \{\boxed{1},\boxed{2}\} \\
\{\boxed{1},\boxed{2}\} & \cup & \{\,\} & = & \{\boxed{1},\boxed{2}\}
\end{array}
\qquad
\begin{array}{rclcl}
\{\,\} & \uplus & \{\,\} & = & \{\,\} \\
\{\boxed{1}\} & \uplus & \{\,\} & = & \{\boxed{1}\} \\
\{\boxed{1}\} & \uplus & \{\boxed{1}\} & = & inconsistent \\
\{\boxed{1}\} & \uplus & \{\boxed{2}\} & = & \{\boxed{1},\boxed{2}\} \\
\{\boxed{1},\boxed{2}\} & \uplus & \{\,\} & = & \{\boxed{1},\boxed{2}\}
\end{array}$$

From this it can be seen that the results of disjoint union are the same as the results of set union except for the case of split SLASH paths, which are disallowed—an element in a mother's SLASH set cannot be shared with more than one daughter.[12]

The revision to the Nonlocal Feature Principle has the effect that no parasitic gap can be generated using the SLASH mechanism. For a-type parasitic gaps this is a desirable result since otherwise they would be ambiguous between my analysis where the a-type parasitic gap is an anaphor and Pollard and Sag's analysis where they result from SLASH propagation. The result is also appropriate for c-type parasitic gaps since these will arise by virtue of the fact that c-type VPs are conjunctive.

In order to bring c-type parasitic gaps into the same domain as coordination, c-type VPs as in (99) must have some property in common with coordinate VPs. One way to bring them together is to follow the Huybregts and van Riemsdijk and Williams route and to reanalyse the subordinating conjunction (*before, by, without*) as a coordinating conjunction and to treat the head and the adjunct VPs as conjuncts.

(99) a.   What did you read __ before filing __?

b.   Who did Kim insult __ by ignoring __?

c.   Which letter did Lee burn __ without reading __?

This would mean that c-type VPs would have to be generated, not by means of the head-adjunct schema, but by the same means as true coordinate structures are generated. At the same time, a means would have to be found to permit the second 'conjunct' to differ from both the mother and the first 'conjunct' in terms of VFORM values. Although it would be possible to develop such an analysis, there is no need to make such a radical move. Instead, I propose that the VPs in (99) should continue to be classified as head-adjunct structures but

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[10] The other difference is the non-conjunctive requirement. The reason for this will become apparent shortly.

[11] See Manandhar (1994) for a definition of disjoint union and for discussion of its uses. I am grateful to Suresh Manandhar for his help in formalising the revisions.

[12] Notice that the new definition does not preclude the possibility that more than one dependency may pass through a single node, as the final two lines in the table indicate. This means that examples such as (i) can still be generated:

(i)   Someone that rude$_i$, I'm not sure who$_j$ to ask __$_j$ to deal with __$_i$.

that the notion of 'conjunction' which underlies both subordinate and coordinate structures should be exploited so as to permit c-type VPs to exhibit some of the behaviour that is found with true coordinate structures. Specifically, I propose that all phrasal categories should be marked with a feature, which I call CONJTYPE, which indicates whether they are conjunctive or not. The value of CONJTYPE is of type *conjtype* and it has subtypes as indicated in the following part of the type-hierarchy.

(100)

$$\begin{array}{c} conjtype \\ \diagup \qquad \diagdown \\ conj \qquad\qquad nonconj \\ \diagup \quad \diagdown \\ symm \qquad\quad asymm \end{array}$$
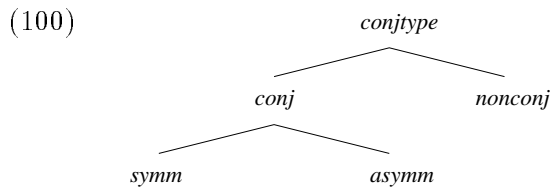
All headed structures apart from head-adjunct structures are marked as [CONJTYPE *nonconj*] while true coordinate structures are marked as [CONJTYPE *conj*]. The marking of head-adjunct structures is determined by the adjunct: adjuncts not headed by a subordinating conjunction are [CONJTYPE *nonconj*] but ones headed by subordinating conjunctions such as *before, while, without* etc. are [CONJTYPE *conj*]. The types *symm* and *asymm* are subtypes of *conj* and add further refinements. The idea behind them is to express the notion of semantic symmetry. Subordinate structures are inherently asymmetric and so all [CONJTYPE *conj*] subordinate structures will be [CONJTYPE *asymm*]. Coordinate structures may be or may not be semantically symmetric and the claim behind the classification is that non-ATB patterns of extraction are only possible in asymmetric coordinations. Classification is largely a semantic matter although the presence of certain syntactic elements may provide additional clues. As illustrated in (101) and (102), the coordinating conjunction pair *both ... and* may only occur in a symmetric coordination while the use of *and then* indicates narrative progression which is asymmetric.

(101) a.   Fred both cooked the supper and did the washing up.

b.   *What did Fred both cook __ and do the washing up?

c.   *What did Fred both cook the supper and do __?

(102) a.   Fred cooked the supper and then did the washing up.

b.   ?What did Fred cook __ and then do the washing up?

c.   What did Fred cook the supper and then do __?

Once structures are marked with appropriate values for CONJTYPE, Pollard and Sag's Co-ordination Principle can be replaced by a more general Conjunction Principle which controls the distribution of gaps both in true coordinate constructions and in c-type parasitic gap constructions. The Conjunction Principle consists of three clauses which are triggered by different parts of the type hierarchy in (100). The entire definition is shown in (103).[13]

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[13] Pollard and Sag's Coordination Principle deals with the other SYNSEM|NONLOCAL|INHER values as well as

(103)   CONJUNCTION PRINCIPLE

    (i)   In a conjunctive structure, the INHER|SLASH value
              on the mother is the union of the INHER|SLASH
              values on the daughters.

    (ii)   In a symmetric structure, the INHER|SLASH
              value on each daughter is token identical to the
              INHER|SLASH value on the mother.

    (iii)   In an asymmetric structure, the INHER|SLASH
              value of a background daughter is the empty set.

Clause (i) sets up the basic pattern for SLASH propagation in conjunctive structures. It uses the set union operation which permits split SLASH paths and which I rejected for the Nonlocal Feature Principle. On its own, clause (i) would permit any pattern of extraction in conjunctive structures. However, clause (ii) requires an ATB pattern of extraction in cases where the structure is symmetric. Clause (iii) deals with asymmetric structures which may be either coordinations or subordinations. This clause requires any "background" daughters not to contain a gap. The Conjunction Principle correctly describes the distribution of gaps both in coordinations and c-type VPs but it does depend on the classification of structures as either symmetric or asymmetric and on the classification of certain daughters in asymmetric conjunctive structures as background daughters. These classifications are semantic in nature and I am not able to provide a precise characterisation of them. The question of symmetry in coordinations is one which has received some attention and it is fairly uncontroversial to assert that a non-ATB pattern of extraction may only occur in an asymmetric coordination. It is more difficult to describe which subparts of a conjunctive structure may be exempt from containing a gap and I use the term "background" as a label for these subparts although I have no formal definition of this term. However, the examples in (104)–(107) provide some illustration.

(104) a.   I can drink ten pints and still stay sober.

     b.   How much can you drink _ and still stay sober?

     c.   *How sober can you drink ten pints and still stay _?

(105) a.   I can drink ten pints without getting drunk.

     b.   How much can you drink _ without getting drunk?

     c.   *How drunk can you drink ten pints without getting _?

---

with SLASH. I have restricted the Conjunction Principle just to SLASH for the time being—further research is needed to determine how the other features behave. Pollard and Sag's Coordination Principle also deals with LOCAL features and, since the the Conjunction Principle replaces the Coordination Principle only with respect to nonlocal features, a revised version of the Coordination Principle would need to be retained to deal with other features:

COORDINATION PRINCIPLE (REVISED)

In an coordinate structure, the SYNSEM|LOCAL|CATEGORY value of each conjunct is subsumed by (is an extension of) that of the mother.

(106) a.   Kim fell asleep and dreamt about goblins.

     b.   What did Kim fall asleep and dream about _?

     c.   *What did Kim do _ and dream about goblins?

(107) a.   Kim woke up after dreaming about goblins

     b.   What did Kim wake up after dreaming about _?

     c.   What did Kim do _ after dreaming about goblins?

(104) shows a coordination where the semantic relationship between the conjuncts is what Goldsmith describes as a *despite* relationship (Lakoff's Type B scenario). The first conjunct may contain a gap but the second conjunct is the background constituent which may not contain a gap. As (105) demonstrates, the same type of relation may occur with a c-type VP structure and when it does, the adjunct is a background constituent and may not contain a gap. (106) shows one of Lakoff's Type A coordinations where the structure describes a natural course of events. In examples such as these, a single gap in the final conjunct is well-formed but a single gap in the initial one is not, therefore the initial conjunct must be marked as a background constituent. The c-type parasitic gap example in (107) contains the same kind of relationship but the data does not quite parallel (106): while an extraction from just the adjunct is acceptable, an extraction from just the head is also possible. From this it can be seen that while the structure is asymmetric, neither head nor adjunct is a background constituent. Asymmetric coordinations may also fail to contain a background constituent, as (108) demonstrates. It would seem that when a conjunctive structure encodes a temporal sequencing, as in (107) or (108), then neither element is a background constituent and a single extraction from either is possible.

(108) a.   Fred checked into the hotel and then phoned his wife straight away.

     b.   Who did Fred check into the hotel and then phone _ straight away?

     c.   Which hotel did Fred check into _ and then phone his wife straight away?

It is not yet clear to me how to characterise the semantic conditions which affect whether structures are symmetric or not and which determine whether subparts of them are background or not. In spite of this shortcoming, however, my analysis does accord with Lakoff's conclusion that patterns of extraction in coordinations must be sensitive to semantic distinctions. Moreover, I have been able to bring c-type parasitic gaps together with coordination and to show how the mechanism of split SLASH paths lies behind ATB extractions from both while still permitting exceptions to the ATB pattern for both.

It follows from my analysis that there might be head-adjunct structures which are non-conjunctive and which do not permit c-type parasitic gaps or extractions from the adjunct and this does indeed seem to be the case. For me, *although* adjuncts pattern in this way:

(109) a.   Sandy was kind to Lee although she disliked her.

     b.   *Who was Sandy kind to _ although she disliked _?

     c.   *Who did Sandy go to lunch although she had to meet _?

     d.   Who was Sandy kind to _ although she disliked her?

The difference between examples with *although* and examples with *without, before* etc. can be modelled by letting the preposition determine whether the larger structure is [CONJTYPE *conj*] or [CONJTYPE *nonconj*]. Furthermore, if there are speakers for whom *although* adjuncts pattern like *without* adjuncts then this variation can be attributed to a minor lexical difference.

In Section 2.1, I divided parasitic gap examples into four groups and I classified those in Group 1 and Group 2 as c-type parasitic gaps. In this section I have only treated Group 1 examples and so I conclude with a brief discussion of the Group 2 examples which I reproduce in (110) and (111):

(110)   ?The blintzes which Sasha is gobbling _ down faster than I can
            reheat $\_\_p$ are extremely tasty, if I do say so.

(111)   Here is the influential professor that John sent his book to _ in order
            to impress $\_\_p$.

The analysis of (111) would be the same as the other examples I have considered in the section. The *in-order-to* phrase is an adjunct in a head-adjunct structure and, assuming it is specified as [CONJTYPE *conj*], the following variants are predicted:

(112) a.   Here is the influential professor that John wrote a book in order
            to impress $\_\_p$.

     b.   Here is the influential professor that John sent his book to _ in order
            to impress him.

A fully-specified analysis of the comparative in (110) would require that the theory of conjunction be extended to cover comparatives as well, and such a project is beyond the scope of this paper. However, I have already remarked on the similarities between comparatives and coordinations and a claim that the gaps in (110) are ATB gaps is probably less controversial than the same claim made for the *without*-type examples.

Acknowledgements

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3

An HPSG Analysis of Turkish Relative Clauses

Zelal Güngördü

Abstract

Relativization in Turkish has an interesting nature in that it is controlled by an interaction between syntax, morphology and context. There are two strategies of relativization in Turkish, *subject participle (SPc)* and *object participle (OPc)*, whose distribution has been the main concern of the accounts of Turkish relative clauses in the literature. These two strategies differ from each other in various respects such as the morphological markings on the verb and the subject of the clause, and the existence/nonexistence of agreement requirement between the subject and the verb. In addition, the context determines the relativization strategy in certain cases as a result of the fact that genitive case-marking on subjects of nonfinite Turkish sentences functions as a marker of specificity. That is, subjects that have a specific interpretation in a given context are marked genitive while others are left unmarked. In the case of relative clauses, this choice further determines the participle suffix on the verb of the clause, hence the relativization strategy. Furthermore, relativization is also possible in embedded phrases of certain kinds such as possessive nominal compounds, postpositional phrases, relative clauses, nominalization phrases and non-subject infinitive phrases, resulting in unbounded dependencies. In this paper, we will first propose a descriptive pattern of relativization in Turkish that determines which relativization strategy to use in a given clause, and then propose an HPSG analysis of relativization in Turkish using that descriptive pattern.

1   Introduction

In Turkish, relative clauses have verbal heads that are morphologically marked with participle suffixes. There are two types of participle suffixes, which are used in two different strategies of relativization in Turkish. There have been several accounts of Turkish relative clauses in the literature which try to formalize the distribution of the two relativization strategies, for example, Underhill (1972), Hankamer and Knecht (1976), Dede (1978), Csató (1985), and Barker *et al.* (1990). (See Knecht (1979) for an overview of the first three accounts.) In this paper, we will first propose a descriptive pattern of relativization in Turkish that determines which relativization strategy to use in a given clause, and then propose an HPSG analysis of relativization in Turkish using that descriptive pattern.

The organisation of the paper is as follows. In Section 2 we consider the examples of bounded relativization in Turkish. In relation to this, we discuss the function of genitive case-marking in non-finite Turkish sentences and relativization in Turkish. In Section 3 we consider examples of relativization in embedded phrases and modify the pattern in Section 2 so that it accounts for unbounded relativization as well as bounded relativization. In Section 4 we discuss a number of constraints on relativization in Turkish. In Section 5 we propose an HPSG analysis of relativization in Turkish using the pattern in Section 3 and also considering the constraints in Section 4. Finally, in Section 6 we state our conclusions and outline a number of issues to be worked on further.

2   Bounded Relativization

The two relativization strategies in Turkish have traditionally been called *subject participle (SPc)*, with the suffix *-yEn*, and *object participle (OPc)*, with the suffix *-DIK*, reflecting the correlation between the grammatical role of the relativized constituent and the choice of the

relativization strategy (Knecht (1979), Sezer (1986)).[1] This correlation is quite strong and the following general pattern applies to most of the cases where there is no long distance dependency:

(1)   **Relativization pattern in Turkish (preliminary version):**

> (a) the SPc strategy is used when the grammatical function of the gap is *subject*,
>
> (b) the OPc strategy is used when the grammatical function of the gap is anything other than subject.

In the case of the OPc strategy, the subject of the relative clause is marked genitive and the participle has a possessive suffix which agrees with the subject (cf. (2b)), whereas there is no such agreement requirement in the case of the SPc strategy (cf. (2c)):

(2)   a.   Adam kadın-ı   gör-dü.   'The man saw the woman.'
              man   woman-ACC see-PAST

      b.   [adam-ın   ___$_i$ gör-düğ-ü]   kadın$_i$ 'the woman that the man saw'
              man-GEN   see-OPc-3sPoss woman

      c.   [___$_i$ kadın-ı   gör-en] adam$_i$ 'the man who saw the woman'
              woman-ACC see-SPc man

Although the pattern given in (1) is quite general, in that it accounts for most of the examples, it has to be revised to deal with some further examples. Consider, for example, (3a), where the locative adjunct *evde* can be relativized using both the SPc strategy as in (3c) and the OPc strategy as in (3b): [2]

(3)   a.   Her gece ev-de   bir çocuk ağlı-yor.
              every night house-LOC a   child   cry-PROG

              'A child cries in the house every night.'

      b.   [her   gece ___$_i$ bir çocuğ-un ağla-dığ-ı]   ev$_i$
              every night   a   child-GEN cry-OPc-3sPoss house

      c.   [her   gece ___$_i$ bir çocuk ağla-yan] ev$_i$
              every night   a   child cry-SPc   house

              'the house where a child cries every night'

(3c,b) have different meanings as a result of the difference in case-marking on the subject. The genitive marked subject *bir çocuğun* in (3b) is specific, meaning the same child must be crying in the house every night. In (3c), on the other hand, the nominative subject *bir çocuk*

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[1] There are a number of other less common suffixes in both classes (SPc and OPc), which we won't consider in this paper.

[2] The same phenomenon applies to any constituent that would normally be relativized with the OPc strategy, namely all kinds of objects and adjuncts.

is nonspecific and it may well be the case that different children cry in the house on different nights.

At this point, it is helpful to examine the function of genitive case-marking on subjects in non-finite Turkish sentences.

2.1 Genitive Marking in Non-finite Turkish Sentences

Subjects of finite sentences are always unmarked (i.e. nominative) in Turkish, and the distinction between the specific and nonspecific readings of a subject NP is indicated by word order:[3] Sentence-initial subjects have a *specific* reading, whereas immediately preverbal subjects may have either (narrow) *specific-focus* or *nonspecific* readings, distinguished by prosody. For example, the sentence initial subject *çocuk* in (4a) is specific. (4b), where the immediately preverbal nominative subject *çocuk* is prosodically marked with stress, is ambiguous having specific and nonspecific subject readings. In the case of the specific reading, the subject *çocuk* is focused, whereas in the case of the nonspecific reading *çocuk* and the verb *ağlıyor* act as a single semantic unit and the activity 'child-crying' (as opposed to any other kind of crying) is focused. Finally, in (4c) the immediately preverbal, unstressed subject *çocuk* is nonspecific.

(4) a. Çocuk her gece ev-de   ağlı-yor.
         child every night house-LOC cry-PROG

         'The child cries in the house every night.'

     b. Her gece ev-de   *çocuk* ağlı-yor.
         every night house-LOC child cry-PROG

         '*The child* cries in the house every night.'
         'There is *child-crying* in the house every night.'

     c. Her gece ev-de   çocuk ağlı-yor.
         every night house-LOC child cry-PROG

         'A child cries/Children cry in the house every night.'

The two alternative interpretations of (4b) would be formally distinguished in a nominalization of the sentence. The subject would be marked genitive in the specific reading as shown in (5b), while it would be left unmarked in the nonspecific reading as shown in (5c). Note that the stress on the genitive marked (specific) subject *çocuğun* in (5b) is no longer obligatory since the fact that the subject is specific is encoded with genitive case-marking anyway. In (5c), however, the stressed version is the nominalization of the nonspecific focus reading of (4b), while the unstressed version is the nominalization of (4c):

(5) a. çocuğ-un her gece ev-de   ağla-dığ-ı
         child-GEN every night house-LOC cry-FACT-3sPoss

         'that the child cries in the house every night'

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[3]There are some NPs that are always specific such as NPs with possessive suffixes, and those with definite or universal determiners. Here, we refer to NPs without such morphological or syntactic features that render them specific.

> b.   her   gece ev-de   *çocuğ-un*/çocuğ-un ağla-dığ-ı
>   every night house-LOC child-GEN   cry-FACT-3sPoss
>
>   'that *the child* cries in the house every night'
>
> c.   her   gece ev-de   *çocuk*/çocuk ağla-dığ-ı
>   every night house-LOC child   cry-FACT-3sPoss
>
>   'that there is *child-crying* in the house every night'
>   'that a child cries/children cry in the house every night'

The same difference in subject marking applies to relative clauses and this further determines the participle suffix on the verb of the clause, and therefore the relativization strategy:

> (6) a.   [çocuğ-un her   gece ___$_i$ ağla-dığ-ı]   ev$_i$
>   child-GEN every night   cry-OPc-3sPoss house
>
>   'the house where the child cries every night'
>
>   b.   [her   gece ___$_i$ *çocuğ-un*/çocuğ-un ağla-dığ-ı]   ev$_i$
>   every night   child-GEN   cry-OPc-3sPoss house
>
>   'the house where *the child* cries every night'
>
>   c.   [her   gece ___$_i$ *çocuk*/çocuk ağla-yan] ev$_i$
>   every night   child   cry-SPc house
>
>   'the house where there is *child-crying* every night'
>   'the house where a child cries/children cry every night'

In (6a,b) (where the subject is specific, hence genitive marked) the OPc strategy is used to relativize the locative adjunct *evde*, whereas the lack of genitive marking on the nonspecific subject in (6c) causes the participle suffix to be SPc, even though the relativized constituent is an adjunct (i.e. non-subject).[4]

In this section, we saw that genitive case-marking on subjects of nonfinite Turkish sentences is used as a marker of specificity. (See Nilsson (1985) for a more general discussion of the function of case-marking, including genitive marking, in Turkish.) We also saw that in the case of relative clauses genitive marking on the subject determines the type of participle suffix on the verb of the clause, hence the relativization strategy. Next, we will concern ourselves with the issue of relativization in Turkish impersonal passives.

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[4]There is one more fact to mention about case-marking of subjects of nonfinite Turkish sentences. Non-specific (nominative) subjects must immediately precede the verb. Hence, (ia,b) are ungrammatical since the nominative subject *çocuk* is not immediately preverbal (cf. (5c) and (6c), respectively):

> (i) a.   * her   gece *çocuk* ev-de   ağla-dığ-ı
>   every night child house-LOC cry-FACT-3sPoss
>
>   b.   * [çocuk her   gece ___$_i$ ağla-yan]   ev$_i$
>   child   every night   cry-OPc-3sPoss house

2.2   Impersonal Passives

Intransitive predicates in Turkish can passivize to form *impersonal passives*, as in (7):

(7) a.   İnsan-lar   bu hava-da   deniz-e   gir-er-ler.
             human-PLU this weather-LOC sea-DAT enter-AOR-3PL

             'People swim in the sea in this weather.'

     b.   Bu hava-da   deniz-e   gir-il-ir.
             this weather-LOC sea-DAT enter-PASS-AOR

             'This weather is good to swim in the sea.'

It was Hankamer and Knecht (1976) who first observed that constituents of such sentences are always relativized using the SPc strategy, whichever constituent is relativized. Consider, for example, (8), where the dative object *denize* and the (locative) temporal adjunct *bu havada* have both been relativized using the SPc strategy:

(8) a.   [bu hava-da $_i$ gir-il-en]   deniz$_i$
             this weather-LOC   enter-PASS-SPc sea

             'the sea that this weather is good to swim in'

     b.   [$_i$ deniz-e   gir-il-en]   bu hava$_i$
                 sea-DAT enter-PASS-SPc this weather

             'this weather which is good to swim in the sea'

In the light of the examples so far, we revise the relativization pattern in (1) in the following way:

(9)   **Relativization pattern in Turkish (revised version):**
           If there is a subject in the clause, whether it is genitive marked or not is determined by contextual factors, and

                (a) the OPc strategy is used if there is a genitive marked subject in the clause,
                (b) the SPc strategy is used otherwise (i.e. if the subject is unmarked or if there is no subject).

(9) accounts for all the examples we have considered so far. If there is a subject in the clause, whether it is genitive marked or not is determined by contextual factors. Once this choice is made, the OPc strategy is used if the subject is genitive marked, and the SPc strategy is used otherwise. On the other hand, if there is no subject in the clause (as in the case of impersonal passives) the SPc strategy is used since there is no genitive marked subject in the clause (trivial case).

Hence, (9) seems to be the relativization pattern in Turkish. Note, however, that none of the above examples contain a long distance dependency. In the next section, we will see that in the case of long distance dependencies the relativization pattern in (9) overgenerates and needs to be further restricted.

3   Unbounded Relativization

In Turkish, relativization is possible in embedded phrases of certain kinds such as relative clauses, possessive nominal compounds, postpositional phrases, nominalization phrases and non-subject infinitive phrases, resulting in structures with long distance dependencies. In this section, we concern ourselves with this kind of relativization.[5]

3.1   Relativization in Relative Clauses

Consider the examples of Turkish relative clauses given in (10)-(13).[6] Note that the (a) examples are similar to the examples we have considered so far, in that they contain only one relative clause. The constituent that is relativized in these examples is an argument of the verbal head of the relative clause as before. The (b) examples, on the other hand, contain two relative clauses, one embedded in the other. The inner clause has two gaps (one of which corresponds to the head noun of the inner clause and the other to that of the outer clause), whereas the outer one has none. Hence, the relativized constituent that corresponds to the head noun of the outer clause is not an argument of the verbal head of this clause, but instead an argument of the verbal head of the inner clause which is a modifier of one of the constituents of the outer clause. Hereafter we refer to that constituent of the outer clause as the *gap host*.[7]

(10) a.   Kadın [adam-ın $\_i$ oku-duğ-u]   kitab-ı$_i$ bil-iyor.
             woman man-GEN   read-OPc-3sPoss book-ACC know-PROG

             'The woman knows the book that the man is reading.'

      b.   [kadın-ın   [$\_j$ $\_i$ oku-duğ-u]   kitab-ı$_i$ bil-diğ-i]   adam$_j$
             woman-GEN   read-OPc-3sPoss book-ACC know-OPc-3sPoss man

             'the man that the woman knows the book he reads'

(11) a.   [$\_i$ Bitki-yi   yi-yen] insan-lar-da$_i$ alerji tespit ed-il-di.
                  plant-ACC eat-SPc person-PLU-LOC allergy determine-PASS-PAST

             'Allergy was diagnosed in the people who ate the plant.'

      b.   [[$\_i$ $\_j$ yi-yen] insan-lar-da$_i$ alerji tespit ed-il-en]   bitki$_j$
                  eat-SPc person-PLU-LOC allergy determine-PASS-SPc plant

             'the plant which allergy was diagnosed in the people who ate (it)'

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[5] Due to space limitations we omit the discussion of relativization in postpositional phrases and non-subject infinitive phrases, though our account covers these cases as well. We occasionally refer to them in Section 5 while presenting the HPSG analysis. (See Güngördü (Forthcoming) for details.)

[6] (11) and (13) are based on two examples given in Sezer (1986), and (12) is taken from Kornfilt *et al.* (1980).

[7] We borrow the term "gap host" from Barker *et al.* (1990), which they define as the highest nominal in the relative clause dominating the gap. However, we use it in a broader sense that includes postpositional phrases, nominalization phrases and infinitive phrases.

(12) a.   [Adam-ın $\_i$ al-dığ-ı]   araba$_i$ bozuk   çık-tı.
              man-GEN   buy-OPc-3sPoss car   defective turn out-PAST

              'The car that the man bought turned out to be defective.'

    b.   [[$\_j$ $\_i$ al-dığ-ı]   araba$_i$ bozuk   çık-an]   adam$_j$
              buy-OPc-3sPoss car   defective turn out-SPc man

              'the man who the car that he bought turned out to be defective'

(13) a.   [$\_i$ Uçağ-ı   kullan-an] pilot$_i$ çıldır-dı.
              plane-ACC fly-SPc   pilot go crazy-PAST

              'The pilot who was flying the plane went crazy.'

    b.   [[$\_i$ $\_j$ kullan-an] pilot-un$_i$ çıldır-dığ-ı]   uçak$_j$
              fly-SPc   pilot-GEN go crazy-OPc-3sPoss plane

              'the plane which the pilot who was flying it went crazy'

It is easy to see that the relativization pattern in (9) accounts for the (a) examples. Coming to the (b) examples, they also seem to be in line with (9): In (10b) and (13b) the OPc strategy is used since the subject is genitive marked, and in (11b) and (12b) the SPc strategy is used since the subject is unmarked. However, (9) wrongly predicts that the following versions of (12b) and (13b) should be grammatical: [8]

(14)   * [[$\_j$ $\_i$ al-dığ-ı]   araba-nın$_i$ bozuk   çık-tığ-ı]   adam$_j$
              buy-OPc-3sPoss car-GEN   defective turn out-OPc-3sPoss man

          'the man who the car that he bought turned out to be defective'

(15)   * [[$\_i$ $\_j$ kullan-an] pilot$_i$ çıldır-an]   uçak$_j$
           fly-SPc   pilot go crazy-SPc plane

          'the plane which the pilot who was flying (it) went crazy'

In accordance with (9), in (14) the subject is marked genitive and the OPc strategy is used, and in (15) the subject is unmarked and the SPc strategy is used. Yet both are ungrammatical.

Until now, in the literature there have been two main independent claims about what determines the choice of relativization strategy in the case of long distance relativization in Turkish: i) the grammatical function of the gap[9] (e.g. Csató (1985)), and ii) the grammatical function of the gap host[10] (e.g. Hankamer and Knecht (1976) and Barker *et al.* (1990)). We claim, however, that both of these factors, in fact, play a role in the choice of the relativization strategy in the outer clause as well as a third factor, namely existence of genitive case-marking on the subject of the outer clause, and further that these three factors interact

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[8](15) is based on an example in Sezer (1986).

[9]In the remaining of this section, in cases with more than one gap, we use the word "gap" to refer to the gap that corresponds to the head noun of the outer relative clause.

[10]We borrow the term *gap host* from Barker *et al.* (1990), which they define as the highest nominal in the relative clause dominating the gap. However, we use it in a broader sense that includes postpositional phrases, nominalization phrases and infinitive phrases.

with each other. More precisely, we claim that in the case of long distance relativization what determines the choice of relativization strategy in the outer clause is: i) the grammatical role of the gap host, ii) existence of genitive case-marking on the subject of the outer clause when the gap host is a non-subject constituent (cf. (10b) and (11b)), and iii) the grammatical role of the gap when the gap host is the subject (cf. (12b) and (13b) In other words, the function of genitive case marking as a marker of specificity is still important in determining the relativization strategy if the gap host is a non-subject constituent, but is overriden by the grammatical role of the gap otherwise. We formalize these facts in the following way:

(16)   **Relativization pattern in Turkish (final version):**

(a) if the gap host is a *non-subject* constituent then
if there is a subject in the clause, whether it is genitive marked or not is determined by contextual factors, and

(i) if there is a *genitive* subject in the clause[11] then
the OPc strategy is used

(ii) else (i.e. if the subject is *nominative* or there is no subject as in *impersonal passives*)
the SPc strategy is used

(b) else if the gap host is the *subject* then

(i) if the grammatical role of the gap is *subject* then
the SPc strategy is used

(ii) else
the OPc strategy is used

Note that (16) is a combination of the first two relativization patterns given in (1) and (9): the first part (i.e. the case where the gap host is a non-subject constituent) is the same as the pattern in (9) and the second part (i.e. the case where the gap host is the subject) is the same as the pattern in (1).[12]

Now, let us see how (16) accounts for (10)-(13). In (10), the gap host is the accusative object (i.e. a non-subject constituent) and there is a genitive marked subject in the clause. In accordance with (16ai) the OPc strategy is used. In (11), on the other hand, the gap host

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[11] Note that Turkish is a pro-drop language and the genitive subject in this case does not need to be an overt one as the examples in Section 3.4 will reveal.

[12] (16a), where the gap host is a non-subject constituent, is quite straightforward and is in line with the account by Barker *et al.* (1990), except they analyze clauses with nominative subjects as subjectless as well (like impersonal passives), claiming that such subjects undergo 'subject incorporation'. As for (16b), where the gap host is subject, we disagree with Barker, Hankamer and Moore on empirical grounds. They claim that there are two dialects with respect to the distribution of the OPc strategy. In one of the dialects (Dialect A) the OPc strategy is impossible in this case, hence the SPc is the only strategy to use, no matter what the grammatical role of the gap is. In the other dialect (Dialect B), on the other hand, both strategies can be used again independent of the grammatical role of the gap. The grammaticality judgements of our informants cause us to reject the claim that the SPc strategy can be used when the grammatical role of the gap is non-subject (except for the cases in which the gap host is a nominalization phrase as we will discuss further in Section 3.3). Turning to the possibility of the OPc strategy when the grammatical role of the gap is subject, we have encountered a number of judgements in favor of this. We do not, however, see ourselves in the position of claiming the existence of two different dialects with respect to this particular case, since these judgements form only a small proportion of the judgements for structurally similar examples.

is again a non-subject constituent, namely the locative adjunct, but this time the subject of the clause is unmarked. Hence, according to (16aii) we would expect the SPc strategy to be used and this is in fact the case. In (12), the gap host is the subject of the clause and the grammatical function of the gap is subject. As (16bi) correctly predicts, the SPc strategy is chosen. Finally, in (13), the gap host is again the subject of the clause, but the grammatical function of the gap is accusative object. Again, in accordance with (16bii) the OPc strategy is used.

Observe that, as required, (16) rules out the ungrammatical examples (14) and (15). In (14), the gap host is the subject of the clause, and the grammatical function of the gap is also subject. Hence, according to (16bi) the SPc strategy, not the OPc strategy, must be used. In (15), on the other hand, the gap host is again the subject, but the gap is the accusative object of the inner clause. Therefore, the use of the SPc strategy contradicts with (16bii).

Thus, (16) accounts for the grammaticality and ungrammaticality of all the examples of unbounded relativization we have considered so far. Importantly, it also covers the examples where there is no long distance dependency. The only crucial point in these examples is that the gap host and the gap coincide. So, for example, in (2b) and (3b) since the gap host (and the gap itself) is an object in the clause and there is a genitive marked subject, the OPc strategy is used (cf. (16ai)). In (3c), on the other hand, although the gap host is again an object, the SPc strategy is used since there is no genitive marked subject in the clause (cf. (16aii)). In (2c), both the gap host and the gap (recall that they coincide) are the subject of the clause, resulting in the SPc strategy according to (16bi). In the case of impersonal passives (cf. (8)), on the other hand, the gap host is always a non-subject constituent since there is no subject in the clause, and the lack of a genitive subject makes SPc the only available strategy (cf. (16aii)). Note that in relativizations with no long distance dependencies the case in (16bii) would never happen since the gap, which coincides with the gap host, can not be both the subject and a non-subject constituent at the same time. Hence, if the gap is the subject then only the SPc strategy can be used (cf. (16bi)) and if it is a non-subject constituent then either the OPc or the SPc strategy can be used depending on whether there is a genitive subject in the clause or not (cf. (16ai) and (16aii), respectively). (Notice that (16) would make exactly the same predictions as (9) in the case of bounded relativization.)

In this section, we have considered some examples of relativization in relative clauses and introduced the final version of the relativization pattern for Turkish (16), which accounts for all the examples of relativization we have considered so far. In the next two sections, we turn to examples of relativization in possessive nominal compounds and nominalization phrases, and show that (16) covers these examples as well.

3.2   Relativization in Possessive Nominal Compounds

Turkish possessive nominal compounds are formed by two nominal constituents one of which is a specific person or thing to which or within which the other one belongs. The possessor precedes the possessed constituent, which is the head of the compound. The possessor is marked genitive, and the head has a possessive suffix which agrees with the possessor:

(17) a.   adam-ın   kız-ı   'the man's daughter'
              man-GEN daughter-3sPoss

b.   adam-ın   güzel   kız-ı   'the man's beautiful daughter'
     man-GEN beautiful daughter-3sPoss

Pollard and Sag claim that in languages like English and German, possessives are best treated as specifiers whereas in other languages like Welsh and Hungarian, it is possible that they are subjects (Pollard and Sag (1994)[pages 374–375]). We assume that Turkish possessives should be treated as subjects too.[13]

Though we don't give the details here we assume that possessive suffix affixation to a noun is handled by a lexical rule that adds a genitive NP which agrees with the affixed suffix into the SUBJ list of the noun, and a *possess* relation into the CONTENT|RESTR set, where the POSSESSOR role is filled by the index of the genitive subject and the POSSESSED role by the index of the noun itself.

Consider now the following examples of relativization in possessive nominal compounds:

(18) a.   [Adam-ın   kız-ı]   sen-i   gör-dü.
     man-GEN daughter-3sPoss you-ACC see-PAST

     'The man's daughter saw you.'

b.   [[_$_i$ kız-ı]   sen-i   gör-en] adam$_i$
     daughter-3sPoss you-ACC see-SPc man

     'the man whose daughter saw you'

(19) a.   Sen [adam-ın   kız-ı-nı]   gör-dü-n.
     you man-GEN daughter-3sPoss-ACC see-PAST-2SG

     'You saw the man's daughter.'

b.   [sen-in   [_$_i$ kız-ı-nı]   gör-düğ-ün] adam$_i$
     you-GEN   daughter-3sPoss-ACC see-OPc-2sPoss man

     'the man whose daughter you saw'

(20) a.   [Adam-ın   kız-ı-nı]   arı   sok-tu.
     man-GEN daughter-3sPoss-ACC bee sting-PAST

     'A bee/some bees stung the man's daughter.'

b.   [[_$_i$ kız-ı-nı]   arı   sok-an]   adam$_i$
     daughter-3sPoss-ACC bee sting-SPc man

     'the man whose daughter a bee/some bees stung'

---

[13] If we assume that they are specifiers, then because specifiers select the heads they specify via the SPEC feature and because possessors in Turkish agree with the possessive suffix on the head, there must be a feature, say POSSESSOR AGREEMENT, for nouns, whose value is the agreement of the possessor if the noun is marked with a possessive suffix and a default value otherwise. Moreover, it must be a head feature since the head can be phrasal as in (17b), and the value of POSSESSOR AGREEMENT must be propagated onto the phrase from its lexical head. Clearly this would lead to too much redundancy in the lexicon. Another possibility would be to have two subtypes for the type *noun*, namely *possessed noun* and *nonpossessed noun*, and then specify the POSSESSOR AGREEMENT as a head feature appropriate for only the type *possessed noun*. However, we believe that such a classification is rather superficial.

The grammaticality of these examples follows from (16). In (18b), the gap host is the subject of the clause and the grammatical function of the gap (the possessor of the nominal compound) is subject. Hence, (16bi) predicts that the SPc strategy must be used as is the case. In (19b), the gap host is the accusative object and there is a genitive subject in the clause. As (16ai) predicts the OPc strategy has been used. In (20b), the gap host is again the accusative object, but the subject, in this case, is unmarked. So, the SPc strategy is used (cf. (16aii)).

3.3 Relativization in Nominalization Phrases

Nominalizations in Turkish are classified into two types depending on the suffixes they occur with: i) *act* type nominalizations have the suffix *-mE*, and ii) *fact* type nominalizations have the suffixes *-DIK* (non-future) or *-EcEK* (future). Recall from Section 2.1 that the subject of a nominalization phrase is either marked genitive (if it is specific) or left unmarked (if it is nonspecific) and the nominalization takes a possessive suffix which agrees with its subject. In addition, a nominalization phrase can be case marked just like an ordinary noun phrase.

Some verbs take act type nominalization phrases as their sentential complements (e.g. *iste-* 'want', *bekle-* 'expect' and *çalış-* 'try'), while some others take fact type nominalization phrases (e.g. *bil-* 'know', *zannet-* 'think' and *um-* 'hope'):

(21) a.　　Ben [Mehmet-'in　bura-ya　gel-me-si-ni]　　　　iste-di-m.
　　　　　　I　　Mehmet-GEN here-DAT come-ACT-3sPoss-ACC want-PAST-1SG

　　　　　　'I wanted Mehmet to come here.'

　　　b.　　Ben [Mehmet-'in　bura-ya　gel-diğ-i-ni]　　　　　zannet-ti-m.
　　　　　　I　　Mehmet-GEN here-DAT come-FACT-3sPoss-ACC think-PAST-1SG

　　　　　　'I thought that Mehmet had come/was coming here.'

As mentioned above, relativization in Turkish is possible in nominalization phrases as well. Consider the following examples:

(22) a.　　[Adam-ın　kadın-ı　　　tanı-ma-sı]　　　bekle-n-iyor.
　　　　　　man-GEN woman-ACC know-ACT-3sPoss expect-PASS-PROG

　　　　　　'It is expected that the man knows the woman.'

　　　b.　　[[__$_i$ kadın-ı　　　tanı-ma-sı]　　　bekle-n-en]　　　adam$_i$
　　　　　　woman-ACC know-ACT-3sPoss expect-PASS-SPc man

　　　　　　'the man who is expected to know the woman'

　　　c.　　* [[__$_i$ kadın-ı　　　tanı-ma-sı-nın]　　　bekle-n-diğ-i]　　　　adam$_i$
　　　　　　woman-ACC know-ACT-3sPoss-GEN expect-PASS-OPc-3sPoss man

(23) a.   [Bu gösteri-ye   500 kişi-nin   katıl-ma-sı]
              this demonstration-DAT   person-GEN participate-ACT-3sPoss

              bekle-n-iyor.
              expect-PASS-PROG

              'It is expected that 500 people will participate in this demonstration.'

     b.   [[$\_i$ 500 kişi-nin   katıl-ma-sı]   bekle-n-en]
                   person-GEN participate-ACT-3sPoss expect-PASS-SPc

              bu   gösteri$_i$
              this demonstration

              'this demonstration in which it is expected that 500 people will participate'

     c.   ? [[$\_i$ 500 kişi-nin   katıl-ma-sı-nın]
                   person-GEN participate-ACT-3sPoss-GEN

              bekle-n-diğ-i]   bu   gösteri$_i$
              expect-PASS-OPc-3sPoss this demonstration

              'this demonstration in which it is expected that 500 people will participate'

In both of these examples the gap host is a nominalization phrase which acts as subject. In (22) the gap is the subject of the inner clause. As can be seen from the grammaticality of (22b) and the ungrammaticality of (22c), the only possible strategy is SPc, a fact which is in line with (16bi). In (23), on the other hand, the gap is the dative object of the inner clause. According to (16bii), one would expect the OPc strategy to be used, but it turns out that all of our informants find (23b) grammatical, whereas only some of them find (23c) grammatical. Although this result conflicts with the relativization pattern given in (16), we consider this contradiction an exception and leave the study of the possible reasons behind it for future research.[14]

Consider now the following examples, where the gap host is a nominalization phrase that acts as the accusative object:

(24) a.   [Başbakan-ın   bu   söz-ü   söyle-diğ-i-ni]   *gazete*
              prime minister-GEN this word-ACC say-FACT-3sPoss-ACC newspaper

              yaz-dı.
              write-PAST

              '*The newspaper* reported that the prime minister said these words.'

     b.   [[$\_i$ bu   söz-ü   söyle-diğ-i-ni]   *gazete-nin*/gazete-nin
                   this word-ACC say-FACT-3sPoss-ACC newspaper-GEN

              yaz-dığ-ı]   başbakan$_i$
              write-OPc-3sPoss prime minister

              'the prime minister who *the newspaper* reported to have said these words'

---

[14]Recall from footnote 12 (page 79) that according to the account by Barker *et al.* (1990) (23b) would be grammatical in both Dialect A and Dialect B, while (23c) would be grammatical only in Dialect B. Hence, their analysis makes the correct predictions in this particular case.

    c.   [[başbakan-ın $\_i$ söyle-diğ-i-ni]   *gazete-nin*/gazete-nin
        prime minister-GEN   say-FACT-3sPoss-ACC newspaper-GEN
        yaz-dığ-ı]   bu söz$_i$
        write-OPc-3sPoss this word

        'these words which *the newspaper* reported the prime minister said'

(25) a.   [Başbakan-ın   bu söz-ü   söyle-diğ-i-ni]   gazete
        prime minister-GEN this word-ACC say-FACT-3sPoss-ACC newspaper
        yaz-dı.
        write-PAST

        'A newspaper/newspapers reported that the prime minister said these words.'

    b.   [[$\_i$ bu söz-ü   söyle-diğ-i-ni]   gazete   yaz-an]
        this word-ACC say-FACT-3sPoss-ACC newspaper write-SPc
        başbakan$_i$
        prime minister

        'the prime minister such that a newspaper/newspapers reported that he said these words'

    c.   [[başbakan-ın $\_i$ söyle-diğ-i-ni]   gazete   yaz-an]
        prime minister-GEN   say-FACT-3sPoss-ACC newspaper-GEN write-SPc
        bu söz$_i$
        this word

        'these words which a newspaper/newspapers reported the prime minister said'

Note that in (24) the 'newspaper' is a specific one (hence marked genitive), whereas in (25) it is not (hence left unmarked). In (24) we see that since there is a genitive subject in the clause, in line with (16ai), the OPc strategy has been used both when the gap is the subject and when it is the object of the inner clause (cf. (24b) and (24c), respectively). In (25), on the other hand, since the subject is nominative, as (16aii) predicts, the SPc strategy has been used in both cases (cf. (25b) and (25c), respectively).

3.4   Complex Examples

Consider the following examples of Turkish relative clauses.[15] Note that the (a) examples involve relativization from a nominalization phrase. The (b) and (c) examples involve a further relativization from the relative clause in the (a) examples. In each case, the two gaps occur in the nominalization phrase.

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[15]Observe that the genitive subject *benim* in these examples is given in parantheses meaning that it is a covert one. It turns out that processing of these examples becomes easier when the subject is dropped.

(26) a.   [(Ben-im) [pilot-un $\_j$ kullan-ma-sı-nı]   iste-diğ-im]   uçak$_j$
           I-GEN   pilot-GEN   fly-ACT-3sPoss-ACC want-OPc-1sPoss plane
           düş-tü.
           crash-PAST

           'The plane that I wanted the pilot to fly crashed.'

     b.   * [[(ben-im) [$\_i$ $\_j$ kullan-ma-sı-nı]   iste-diğ-im]   uçağ-ın$_j$
           I-GEN   fly-ACT-3sPoss-ACC want-OPc-1sPoss plane-GEN
           düş-tüğ-ü]   pilot$_i$
           crash-OPc-3sPoss pilot

           'the pilot such that the plane that I wanted him to fly crashed'

     c.   [[(ben-im) [$\_i$ $\_j$ kullan-ma-sı-nı]   iste-diğ-im]   uçak$_j$ düş-en]   pilot$_i$
           I-GEN   fly-ACT-3sPoss-ACC want-OPc-1sPoss plane crash-SPc pilot

           'the pilot such that the plane that I wanted him to fly crashed'

(27) a.   [(Ben-im) [$\_i$ uçağ-ı   kullan-ma-sı-nı]   iste-diğ-im]   pilot$_i$
           I-GEN   plane-ACC fly-ACT-3sPoss-ACC want-OPc-1sPoss pilot
           öl-dü.
           die-PAST

           'The pilot who I wanted to fly the plane died.'

     b.   [[(ben-im) [$\_i$ $\_j$ kullan-ma-sı-nı]   iste-diğ-im]   pilot-un
           I-GEN   fly-ACT-3sPoss-ACC want-OPc-1sPoss pilot-GEN
           öl-düğ-ü]   uçak$_j$
           die-OPc-3sPoss plane

           'the plane that the pilot who I wanted to fly died'

     c.   * [[(ben-im) [$\_i$ $\_j$ kullan-ma-sı-nı]   iste-diğ-im]   pilot öl-en]   uçak$_j$
           I-GEN   fly-ACT-3sPoss-ACC want-OPc-1sPoss pilot die-SPc plane
           'the plane that the pilot who I wanted to fly died'

(28) a.   [(Ben-im) [$\_i$ uçağ-ı   kullan-ma-sı-nı]   iste-diğ-im]
           I-GEN   plane-ACC fly-ACT-3sPoss-ACC want-OPc-1sPoss
           pilot-u$_i$ düşman öl-dür-dü.
           pilot-ACC enemy   die-CAUS-PAST

           'The enemy/an enemy killed the pilot who I wanted to fly the plane.'

     b.   [[(ben-im) [$\_i$ $\_j$ kullan-ma-sı-nı]   iste-diğ-im]   pilot-u
           I-GEN   fly-ACT-3sPoss-ACC want-OPc-1sPoss pilot-ACC
           düşman-ın öl-dür-düğ-ü] uçak$_j$
           pilot-ACC enemy-GEN   die-CAUS-OPc-3sPoss plane

           'the plane such that the enemy killed the pilot who I wanted to fly (it)'

c.   [[(ben-im) [$\_i$ $\_j$ kullan-ma-sı-nı]   iste-diğ-im]   pilot-u
          I-GEN   fly-ACT-3sPoss-ACC want-OPc-1sPoss pilot-ACC
          düşman öl-dür-en]   uçak$_j$
          enemy   die-CAUS-SPc plane

          'the plane such that an enemy killed the pilot who I wanted to fly (it)'

The grammaticality/ungrammaticality of these examples follows from the relativization pattern in (16). In all three (a) examples, the gap host in the relative clause is a non-subject constituent (i.e. a nominalization phrase that acts as the accusative object), and the relative clause has a genitive subject. Hence, as (16ai) predicts, the OPc strategy has been used in these examples. As for the (b) and the (c) examples, the gap host in the inner relative clause, in each case, is a non-subject constituent (i.e. again a nominalization phrase that acts as the accusative object), and the clause has a genitive subject. So, the use of the OPc strategy is in line with (16ai). The critical point in these examples is the relativization strategy used in the outer relative clause. In (26b,c), the gap host (in the outer relative clause) is the subject of the clause. The grammatical role of the gap (in the nominalization phrase) which corresponds to the head noun of the outer relative clause is again subject. Hence, according to (16bi), the SPc strategy must be used, as evidenced by the ungrammaticality of (26b) and the grammaticality of (26c). In (27b,c), on the other hand, the gap host is again the subject of the outer clause. The gap in this case, however, is the accusative object of the nominalization phrase. Hence, the use of the OPc strategy as in (27b) is in line with (16bii), as opposed to the use of the SPc strategy which renders (27c) ungrammatical. Finally, in (28b,c), the gap host is the accusative object of the outer relative clause. Therefore, both the OPc strategy (cf. (28b)) and the SPc strategy (cf. (28c)) can be used depending on whether there is a genitive subject in the clause or not (cf. (16ai) and (16aii), respectively).

So far, we have concerned ourselves with finding a descriptive account of Turkish relative clauses by trying to formulate the distribution of the two relativization strategies in Turkish. We have considered a broad set of examples of relative clauses and presented a (descriptive) relativization pattern that accounts for these examples. In the following sections, we will first discuss a number of constraints on relativization in Turkish and then present an account of relativization in Turkish within HPSG.

4   Constraints on Relativization in Turkish

Constraint on Non-subject Relativization

In Section 3, we considered several examples of relativization in Turkish where two constituents were relativized in the same clause (i.e. either in the same relative clause as in the examples in Section 3.1, or in the same nominalization phrase as in the examples in Section 3.4). Note that in all those examples one of the relativized constituents was the subject of the clause and the other one was a non-subject constituent. We have not seen any examples in which both of the constituents relativized in the same clause are non-subject constituents and the reason for this is that this is not possible in Turkish.[16] Consider, for example, (29)

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[16] Note, however, that it is in general possible to extract two non-subject constituents in the same clause in the case of other UDCs such as topicalization and backgrounding in Turkish. (See Erguvanlı (1979) for a more

and (30), which show that there is such a constraint in the case of relativization in relative clauses:[17]

(29) a.   Ben [çocuğ-un _$_i$ ev-e   git-tiğ-i]   okul-u$_i$ gör-dü-m.
            I   child-GEN   house-DAT go-OPc-3sPoss school-ACC see-PAST-1s

      'I saw the school from where the child went home.'

      b.   * [ben-im [çocuğ-un _$_i$ _$_j$ git-tiğ-i]   okul-u$_i$ gör-düğ-üm]   ev$_j$
            I-GEN   child-GEN   go-OPc-3sPoss school-ACC see-OPc-1sPoss house

      'the house such that I saw the school from where the child went there'

(30) a.   [Adam-ın kitab-ı   _$_i$ oku-duğ-u]   ev$_i$ yan-ıyor.
            man-GEN book-ACC   read-OPc-3sPoss house burn-PROG

      'The house where the man is reading the book is on fire.'

      b.   * [[adam-ın _$_i$ _$_j$ oku-duğ-u]   ev-in$_i$ yan-dığ-ı]   kitap$_j$
            man-GEN   read-OPc-3sPoss house-GEN burn-OPc-3sPoss book

      'the book such that the house where the man is reading it is on fire'

      c.   * [[adam-ın _$_i$ _$_j$ oku-duğ-u]   ev$_i$ yan-an]   kitap$_j$
            man-GEN   read-OPc-3sPoss house burn-SPc book

      'the book such that the house where the man is reading it is on fire'

In (29a), the accusative object *okulu* is modified by a relative clause which contains an ablative object gap. When one tries to relativize the dative object *eve*, too, one ends up with the ungrammatical clause (29b).[18]

Similarly, in (30a) the subject *ev* is modified by a relative clause which contains a locative adjunct gap. Again, any attempt of relativizing another non-subject constituent (the accusative object *kitabı* in this example) fails as can be seen from the ungrammaticality of (30b), where the OPc strategy has been used, and (30c), where the SPc strategy has been used.

Constraint on Relativization of Nominative Subjects of Non-finite Sentences

In Section 2.1, we saw that genitive marking or unmarking of subjects of non-finite Turkish sentences depends on contextual factors, and that specific subjects are marked genitive, whereas nonspecific ones are left unmarked. The following example shows that it is not possible to relativize nominative (nonspecific) subjects of non-finite Turkish sentences:

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detailed discussion of the function of word order in Turkish and several pragmatic functions like topicalization, focusing and backgrounding.)

[17] The same restriction also holds true for other types of nonfinite sentences where object relativization is possible such as nominalization and infinitive phrases. Here, we do not provide any examples for these cases due to space limitations.

[18] Note that since there is a genitive marked subject *benim* in the outer clause, the only relevant strategy is OPc. That is why we don't give the version with SPc, which is also ungrammatical.

(31)   a.   [[_$_i$ Bacağ-ı-nı]   arı sok-an]   kız$_i$ ağla-dı.
           leg-3sPoss-ACC bee sting-SPc girl cry-PAST

           'The girl whose leg was stung by a bee cried.'

       b.   * [[_$_i$ bacağ-ı-nı]   _$_j$ sok-an]   kız$_i$ ağla-yan] arı$_j$
           leg-3sPoss-ACC   sting-SPc girl cry-SPc   bee

           'the bee such that the girl whose leg was stung by it cried'

       c.   * [[_$_i$ bacağ-ı-nı]   _$_j$ sok-an]   kız-ın$_i$ ağla-dığ-ı]   arı$_j$
           leg-3sPoss-ACC   sting-SPc girl-GEN cry-OPc-3sPoss bee

           'the bee such that the girl whose leg was stung by it cried'

The relative clause in (31a), which modifies the subject *kız*, contains a nominative (nonspecific) subject *arı*, which cannot be relativized as can be seen from the ungrammaticality of (31b,c).

Constraint on Relativization across Finite Sentences

In Turkish, no relativized constituent can cross the boundaries of a *finite* sentence, whereas an extracted (e.g. topicalized or backgrounded) constituent can. In (32), for example, the finite sentential complement of *sandı* contains an embedded nominalization phrase whose accusative object can be topicalized as in (32a), but cannot be relativized as shown in (32b):

(32)   a.   [Kitab-ı]$_i$ adam [$_S$ ban-a   kadın   [$_{NomP}$ çocuğ-un   _$_i$
           book-ACC man   I-DAT woman   child-GEN
           oku-duğ-u-nu]   söyle-di]   san-dı.
           read-FACT-3sPoss-ACC tell-PAST think-PAST

           'The book, the man thought that the woman told me that the child had read.'

       b.   * [$_{PartP}$ adam-ın [$_S$ ban-a   kadın   [$_{NomP}$ çocuğ-un   _$_i$
                   man   I-DAT woman   child-GEN
           oku-duğ-u-nu]   söyle-di]   san-dığ-ı]   kitap$_i$
           read-FACT-3sPoss-ACC tell-PAST think-OPc-3sPoss book

           'the book that the man thought that the woman told me that the child had read'

Since we know that it is possible to relativize constituents in nominalization phrases, the difference in the grammaticality of (32a) and (32b) must be due to a constraint which blocks the crossing of relativized constituents across the boundaries of finite sentences. Yet, to be sure, let us consider the following example, where this finite sentential complement has been replaced by a nominalization phrase:

(33)   a.   [Kitab-ı]$_i$ adam [$_{NomP}$ ban-a   kadın-ın   [$_{NomP}$ çocuğ-un   _$_i$
           book-ACC man   I-DAT woman-GEN   child-GEN
           oku-duğ-u-nu]   söyle-diğ-i-ni]   san-dı.
           read-FACT-3sPoss-ACC tell-FACT-3sPoss-ACC think-PAST

           'The book, the man thought that the woman told me that the child had read.'

b.   [$_{\text{PartP}}$ adam-ın [$_{\text{NomP}}$ ban-a   kadın-ın   [$_{\text{NomP}}$ çocuğ-un $_{-i}$
           man   I-DAT woman-GEN   child-GEN
oku-duğ-u-nu]   söyle-diğ-i-ni]   san-dığ-ı]   kitap$_i$
read-FACT-3sPoss-ACC tell-FACT-3sPoss-ACC think-OPc-3sPoss book

'the book that the man thought that the woman told me that the child had read'

The only difference between the examples in (32) and the corresponding examples in (33) is that in the latter case the finite sentential complement is converted to a nominalization phrase, in which case both topicalization and relativization of *kitabı* are possible (cf. (33a) and (33b), respectively).

5   An Analysis within HPSG

In this section, we present an HPSG analysis of relativization in Turkish using the descriptive pattern of relativization in (16), which we derived in Section 3.1, and also taking into account the constraints that we discussed in Section 4. For the purposes of this paper, we concern ourselves with only argument relativization, leaving adjunct relativization for futher research. The important features of the analysis are as follows:

Firstly, we present an analysis in terms of lexically specified MOD values.[19] We have a number of lexical rules to derive participles from *base* verbs and to deal with relativization in embedded phrases.

Secondly, it is obvious that in order to implement the second part of the relativization pattern in (16), we need to have a mechanism which, at the outer clause level, differentiates between the different grammatical roles the gap might have (namely, subject/non-subject distinction). However, there is no need to encode such an information in the case of other UDCs like topic-alization and backgrounding. Hence, we introduce a new NONLOCAL feature RELATIVIZED,[20] in addition to SLASH, for the analysis of relative clauses in Turkish. RELATIVIZED takes values of sort *relativized* with two appropriate features, SPC and OPC, both of which take values of sort *set(local)*.

Thirdly, in Section 4 we saw that in Turkish no relativized constituent can cross the boundaries of a *finite* sentence, whereas an extracted (topicalized or backgrounded) constituent can. Using a separate NONLOCAL feature, RELATIVIZED, in the analysis of relative clauses lets us formalize this language particular constraint as follows:

(34)   Finite Sentence Relativized Constraint (parochial for Turkish):

Finite sentences must have empty values for the INHER|RELATIVIZED features (SPC and OPC).

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[19] The idea of having such an analysis for languages like Korean where the verbal head of a relative clause bears identifying morphology is suggested by Pollard and Sag (1994)[page 57].

[20] Note that RELATIVIZED is a different feature from the NONLOCAL feature RELATIVE (REL) in standard HPSG, which takes values of sort *set(ref)* and whose main function is to encode a relative dependency (i.e. a dependency between the relative word and the head noun with which it shares an index) in a relative clause (see Pollard and Sag (1994)[pages 210-220] for details). We assume that there is no need to use the REL feature in the analysis of Turkish relative clauses since there is no such dependency in Turkish.

The final point to note is that we analyse Turkish relative clauses as weak UDCs. That is, the gap and the head noun of the clause structure-share only their INDEX values (e.g. they need not have the same case as can be seen from the examples we have considered in the previous sections).

Having highlighted the important points about the analysis, we turn in the next section to the lexical rules which form the basis of the analysis.

5.1   The Lexical Rules

The lexical rules in the analysis can be mainly classified into the following three sets:

(i)   The rules in the first set derive participles to be used in the case of *bounded* relativization from *base* verbs when they get one of the participle suffixes.

(ii)   The rules in the second set derive participles to be used in the case of *unbounded* relativization from *base* verbs when they get one of the participle suffixes. These participles function as the verbal head of the outer clause (where a long distance dependency is bound off) in an unbounded relativization.

(iii)   The rules in the third set are responsible for relativization in embedded phrases like relative clauses, possessive nominal compounds, postpositional phrases, nominalization phrases and infinitive phrases.

The main difference between the rules in the first two sets, and the ones in the third set is that the former change the MOD value of the input lexical entry (which is specified as being of sort *none* for *base* verbs in the lexicon) to an object of sort *synsem* that selects the SYNSEM value of the head noun of the relative clause, and change the CONTENT value of the input entry (which is of sort *psoa*) to an object of sort *nom-object*, whereas the latter leave the MOD and the CONTENT values of the input unchanged. In addition, the *phon* value of the input is also changed in the former case, in that either the SPc suffix *-yEn* or the OPc suffix *-DIK* is affixed to it, though we do not show the PHON feature in the lexical rules.

The main difference between the rules in the first and the third sets, and the ones in the second set is that in the former case one of the arguments is relativized, that is, it is removed from one of the valence lists (SUBJ or COMPS) and is placed within one of the INHER|RELATIVIZED sets (SPC or OPC).[21] In the case of the rules in the second set, on the other hand, no argument is relativized, but instead a further restriction is placed on one of the arguments (the one which is to function as the gap host in an unbounded relativization) that requires it to have a nonempty value for one of the INHER|RELATIVIZED features (SPC or OPC).

In the following sections, we present the rules in these three sets together with some example derivations.

---

[21] The idea behind these rules is similar to that behind the extraction lexical rules proposed by Pollard and Sag (1994)[Pages 376-384] in the traceless account of UDCs in this respect.

5.1.1 Participle Derivation for Bounded Relativization

There are three rules in this set having the following functions: i) participle derivation for subject relativization, ii) participle derivation for object relativization for cases when the subject is genitive marked (specific), and iii) participle derivation for object relativization for cases when the subject is nominative (nonspecific). As mentioned above, the rules in this set have the following common features:

(i) They change the MOD value of the input so that the resulting MOD value is an object of sort *synsem* which selects the SYNSEM value of the head noun, and the CONTENT value of the input to an object of sort *nom-object*.

(ii) They relativize an argument of the input lexical entry, i.e. remove it from one of the valence lists and place within one of the INHER|RELATIVIZED sets.

Subject Relativization:
The lexical rule in (35), which is responsible for bounded subject relativization, takes a verb in *base* form as its input lexical entry and returns, as its output, one in *s-part (subject-participle)* form. Furthermore it removes the only element in the SUBJ list from this list and places it within the INHER|RELATIVIZED|SPC value of the output. The MOD value of the input is of sort *none*, whereas that of the output is of sort *synsem* which selects an N′ (the head noun) whose TO-BIND|RELATIVIZED|SPC value contains exactly one element which is structure-shared with the element in the INHER|RELATIVIZED|SPC value of the participle. Furthermore, the index of the head noun is structure-shared with that of the element in its TO-BIND|RELATIVIZED|SPC set (and hence, with that of the element in the INHER|RELATIVIZED|SPC set of the participle). The content value of the output is a nominal object whose index coincides with that of the head noun, and whose restriction is the set of psoas obtained by adding the content value of the input lexical entry (which is of sort *psoa*) to the restrictions imposed by the head noun.

$$
(35) \quad
\begin{bmatrix}
\text{HEAD} & verb \begin{bmatrix} \text{VFORM} & bse \\ \text{MOD} & none \end{bmatrix} \\
\text{SUBJ} & \langle \text{NP}[\text{LOC } \boxed{3}] \rangle \\
\text{CONTENT} & \boxed{2}
\end{bmatrix}
\implies
$$

$$
\begin{bmatrix}
\text{HEAD} & verb \begin{bmatrix} \text{VFORM} & s - part \\ \text{MOD} & \text{N}'[\text{TO-BIND}|\text{RELATIVIZED}|\text{SPc} \left\{ \boxed{3}\boxed{1} \right\}] : \begin{bmatrix} \text{INDEX} & \boxed{1} \\ \text{RESTR} & \boxed{4} \end{bmatrix} \end{bmatrix} \\
\text{SUBJ} & \langle \rangle \\
\text{CONTENT} & \begin{bmatrix} \text{INDEX} & \boxed{1} \\ \text{RESTR} & \{\boxed{2}\} \cup \boxed{4} \end{bmatrix} \\
\text{INHER}|\text{RELATIVIZED}|\text{SPC} & \{\boxed{3}\}
\end{bmatrix}
$$

Let us now consider an example that illustrates how this lexical rule works. The structure of the relative clause in (36) is given in (37). Note that the lexical entry for the *s-part* verb *gören* in this structure is the output of the rule in (35). The structure-sharing (tag $\boxed{1}$) of the INDEX values of the head noun and the element in the TO-BIND|RELATIVIZED|SPC set of the head noun (hence, the element in the INHER|RELATIVIZED|SPC set of the participle),

ensures that the SEER role of the *see* relation (in the CONTENT|RESTR value) is filled by this index since it is the index of the subject NP in the original lexical entry for the *base* verb *gör*, which has been relativized by the rule in (35). The nonempty INHER|RELATIVIZED|SPC value introduced by the lexical entry of the participle is passed on the mother S node by the Nonlocal Feature Principle, and then bound off by the TO-BIND|RELATIVIZED|SPC value of the N$'$ again because of the Nonlocal Feature Principle. Hence, the mother NP node has an empty INHER|RELATIVIZED|SPC value. Note also that the content value of the relative clause, which is structure-shared with the content value of the participle (i.e. the head daughter of the relative clause), is also structure-shared with that of the mother NP since the relative clause is the adjunct daughter of this mother (because of the Semantics Principle).

(36)   [__$_i$ kadın-ı   gör-en] adam$_i$ 'the man who sees the woman'
         woman-ACC see-SPc man

(37)
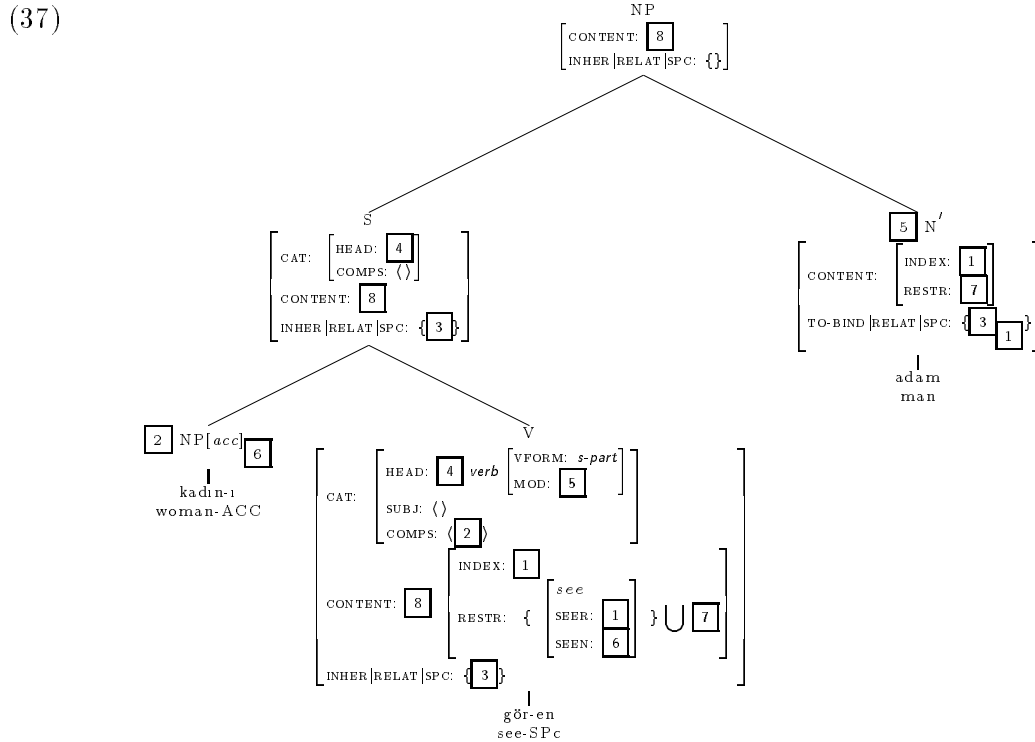
Object Relativization when the Subject is Genitive-marked (Specific):
The lexical rule in (38) takes care of bounded object relativization when the subject of the clause is specific, hence genitive marked. The VFORM value is changed from *base* to *o-part (object-participle)*, and one of the elements in the COMPS list of the input is removed from this list and placed within the INHER|RELATIVIZED|OPC value of the output. Furthermore, the subject of the output has been constrained to be *genitive*. The MOD value is changed from *none* to an object of sort *synsem* which selects an N$'$ (the head noun) whose TO-BIND|RELATIVIZED|OPC value has exactly one element which is structure-shared with the element in the INHER|RELATIVIZED|OPC value of the participle. The coindexing of the head noun and the elements in the RELATIVIZED|OPC values (tag $\boxed{1}$) is similar to that in the rule in (35). The content value of the output is exactly the same as that of the output of the rule in (35).

(38)

$$
\begin{bmatrix}
\text{HEAD} & verb\begin{bmatrix}\text{VFORM } bse \\ \text{MOD} & none\end{bmatrix} \\
\text{SUBJ} & \langle\text{NP}\rangle \\
\text{COMPS} & \langle ..., \text{NP[LOC } \boxed{3}\,], ...\rangle \\
\text{CONTENT} & \boxed{2}
\end{bmatrix}
\implies
$$

$$
\begin{bmatrix}
\text{HEAD} & verb\begin{bmatrix}\text{VFORM } o-part \\ \text{MOD} & \text{N}'[\text{TO-BIND}|\text{RELATIVIZED}|\text{OP}c\,\{\boxed{3}_{\boxed{1}}\}] : \begin{bmatrix}\text{INDEX } \boxed{1} \\ \text{RESTR } \boxed{4}\end{bmatrix}\end{bmatrix} \\
\text{SUBJ} & \langle\text{NP}[gen]\rangle \\
\text{COMPS} & \langle ... \rangle \\
\text{CONTENT} & \begin{bmatrix}\text{INDEX } \boxed{1} \\ \text{RESTR } \{\boxed{2}\} \bigcup \boxed{4}\end{bmatrix} \\
\text{INHER}|\text{RELATIVIZED}|\text{OPC} & \{\boxed{3}\}
\end{bmatrix}
$$

The structure of the relative clause in (39) is given in (40). The lexical entry for the *o-part* verb *gördüğü* is the output of the rule in (38). Note that since the index of the head noun is structure-shared with that of the relativized object of the *base* verb *gör*, in this case, it is the SEEN role of the *see* relation (in the CONTENT|RESTR value of the participle) that is filled by this index.

(39) [adam-ın —$_i$ gör-düğ-ü] kadın$_i$ 'the woman that the man sees'
      man-GEN   see-OPc-3sPoss woman

(40)
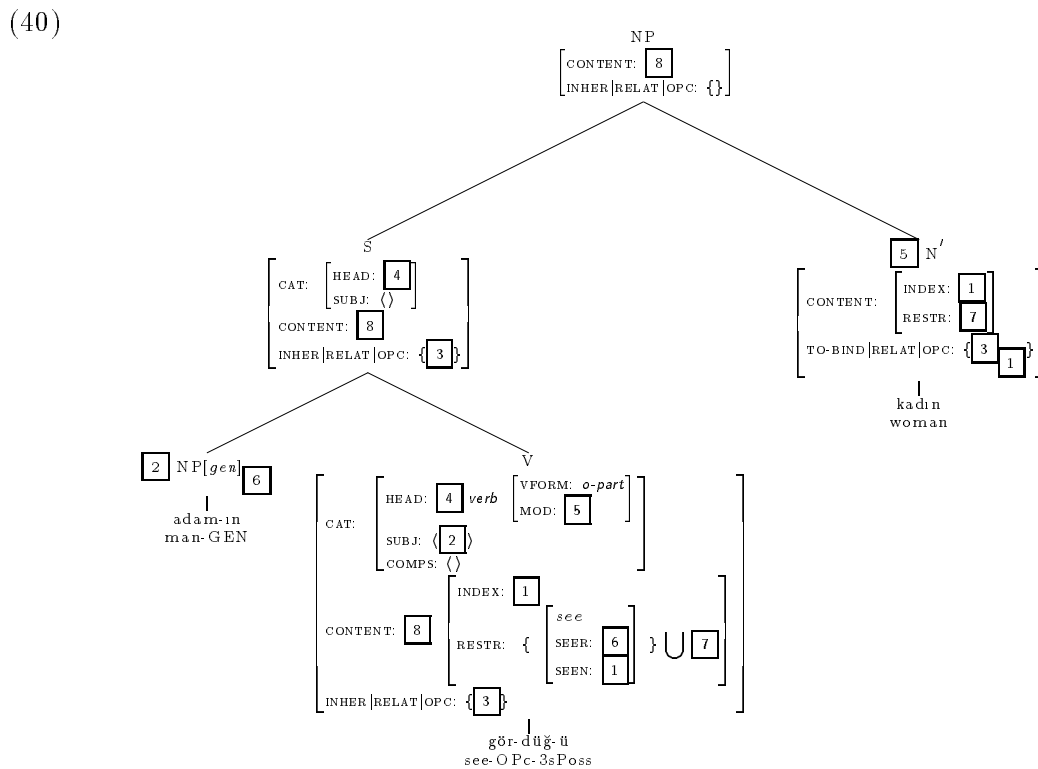
Object Relativization when the Subject is Nominative (Nonspecific):
The rule in (41) is similar to the one in (38), in that it relativizes one of the elements in the COMPS list. In this case, however, the subject of the output is constrained to be *nominative* and *nonspecific*.[22] Accordingly, the output is a verb of form *s-part*, hence the relativized complement is placed within the INHER|RELATIVIZED|SPC value of the output (even though it is a non-subject complement).

$$
(41) \quad
\begin{bmatrix}
\text{HEAD} & verb\begin{bmatrix}\text{VFORM } bse \\ \text{MOD} \quad none\end{bmatrix} \\
\text{SUBJ} & \langle \text{NP} \rangle \\
\text{COMPS} & \langle ..., \text{NP[LOC } \boxed{3} \text{]}, ... \rangle \\
\text{CONTENT} & \boxed{2}
\end{bmatrix}
\Longrightarrow
$$

$$
\begin{bmatrix}
\text{HEAD} & verb\begin{bmatrix}\text{VFORM } s-part \\ \text{MOD} \quad \text{N}'[\text{TO-BIND|RELATIVIZED|SPc}\left\{\boxed{3}_{\boxed{1}}\right\}] : \begin{bmatrix}\text{INDEX } \boxed{1} \\ \text{RESTR } \boxed{4}\end{bmatrix}\end{bmatrix} \\
\text{SUBJ} & \langle \text{NP}[nom, nonspecific] \rangle \\
\text{COMPS} & \langle ... \rangle \\
\text{CONTENT} & \begin{bmatrix}\text{INDEX } \boxed{1} \\ \text{RESTR } \{\boxed{2}\} \bigcup \boxed{4}\end{bmatrix} \\
\text{INHER|RELATIVIZED|SPC} & \{\boxed{3}\}
\end{bmatrix}
$$

The structure of the relative clause in (42), where the object has been relativized and the subject has been left unmarked (nominative) since it is nonspecific, is given in (43). Note that the lexical entry for the *s-part* verb *sokan* is derived by the rule in (41), hence the subject is *nominative* and *nonspecific*.

(42)   [—$_i$ arı sok-an]   kız$_i$
              bee sting-SPc girl

        'the girl whom a bee/some bees stung'

---

[22] We have introduced a new head feature SPECIFICITY for objects of sort *noun* and *determiner* in an earlier work, which we make use of here (see Güngördü (Forthcoming) for details). The way this feature is specified for the nouns and the determiners in the lexicon and a reformulation of the Head Feature Principle for Turkish make sure that NPs like pronouns, proper nouns, possessive nominal compounds and NPs with definite or universal determiners are *specific*, whereas all other NPs are left as *nonspecific* though they might be interpreted as specific depending on the context. Hence, the constraint that the subject of the output entry of (41) must be *nonspecific* serves to prevent a *specific* NP (i.e. one of those mentioned above) from being a nominative subject, rather than placing a constraint in the CONTEXT field of the subject that requires it to have a nonspecific interpretation. That is in fact why there is no constraint on the output of the rule in (38) which restricts the subject NP to be *specific*.

(43)

$$
\begin{array}{c}
\text{NP} \\
\left[\begin{array}{l}
\text{CONTENT: } \boxed{8} \\
\text{INHER|RELAT|SPC: \{\}}
\end{array}\right]
\end{array}
$$

S
$$
\left[\begin{array}{l}
\text{HEAD: } \boxed{4} \\
\text{SUBJ: } \langle\rangle \\
\text{CONTENT: } \boxed{8} \\
\text{INHER|RELAT|SPC: \{ \boxed{3} \}}
\end{array}\right]
$$

$\boxed{5}$ N$'$
$$
\left[\begin{array}{l}
\text{CONTENT: } \left[\begin{array}{l}\text{INDEX: } \boxed{1} \\ \text{RESTR: } \boxed{7}\end{array}\right] \\
\text{TO-BIND|RELAT|SPC: \{ } \boxed{3}\, \boxed{1} \}
\end{array}\right]
$$

kız
girl

$\boxed{2}$ NP[*nom, nonspecific*] $\boxed{6}$

arı
bee

V
$$
\left[\begin{array}{ll}
\text{HEAD: } \boxed{4}\ \textit{verb} & \left[\begin{array}{l}\text{VFORM: } \textit{s-part} \\ \text{MOD: } \boxed{5}\end{array}\right] \\
\text{SUBJ: } \langle\, \boxed{2}\, \rangle & \\
\text{COMPS: } \langle\rangle & \\
\text{CONTENT: } \boxed{8} & \left[\begin{array}{l}\text{INDEX: } \boxed{1} \\ \text{RESTR: } \{ \left[\begin{array}{l}\textit{sting} \\ \text{STINGER: } \boxed{6} \\ \text{STINGEE: } \boxed{1}\end{array}\right] \} \cup \boxed{7}\end{array}\right] \\
\text{INHER|RELAT|SPC: \{ } \boxed{3}\ \}
\end{array}\right]
$$

sok-an
sting-SPc

5.1.2   Participle Derivation for Unbounded Relativization

The rules in this section derive participles from *base* verbs to be used in the case of unbounded relativization. There are four rules in this set, which correspond to the four different cases of the relativization pattern in (16), repeated here for convenience:

(16)   **Relativization pattern in Turkish (final version):**

(a) if the gap host is a *non-subject* constituent then
    if there is a subject in the clause, whether it is genitive marked or not is
    determined by contextual factors, and
    (i) if there is a *genitive* subject in the clause then
            the OPc strategy is used
    (ii) else (i.e. if the subject is *nominative* or there is no subject as in
            impersonal passives)
            the SPc strategy is used
(b) else if the gap host is the *subject* then
    (i) if the grammatical role of the gap is *subject* then
            the SPc strategy is used
    (ii) else
            the OPc strategy is used

All these four rules have the following common features:

(i) They change the MOD value of the input entry (which is specified as *none* for the *base* verbs in the lexicon) to an object of sort *synsem* that selects the SYNSEM value of the head noun, and they change the CONTENT value to an object of sort *nom-object*.

(ii) They do not relativize an argument of the input entry, but instead place a constraint on one of the arguments which requires it to have a nonempty value for one of the INHER|RELATIVIZED features. Note that it is that argument that corresponds to the gap host in the formulation of the relativization pattern in (16).

Non-subject Gap Host – Genitive Subject (16ai)

The lexical rule in (44) deals with the case described in (16ai), where the gap host is a non-subject constituent and there is a *genitive* subject in the clause. The fact that the OPc strategy must be used in this case determines the VFORM value of the output to be of sort *o-part*. The rule also places a constraint on one of the INHER|RELATIVIZED features of one of the elements in the COMPS list (the gap host) forcing it to have a nonempty value. Furthermore, the element in this nonempty set is structure-shared with the element in the corresponding TO-BIND|RELATIVIZED set of the head noun (tag 2) to bind this long distance dependency off once the head noun combines with the relative clause headed by this participle. Note that the grammatical function of the gap itself is not important in this case. That is why the value of the variable Y ranges over the set $\{\text{SPC}, \text{OPC}\}$.[23] The gap host, however, is guaranteed to be a non-subject argument since it occurs in the COMPS list. Syntactically, it can be an NP (either a possessive nominal compound or an NP modified by a relative clause) or a PP or an S[*nominalization*] (nominalization phrase) or a VP[*inf*] (infinitive phrase).[24] The content value of the output is a nominal object (as in the case of participle derivation for bounded relativization) whose index coincides with that of the head noun, and whose restriction is the set of psoas obtained by adding to the restrictions imposed by the head noun the content value of the input lexical entry (which is of sort *psoa*).

$$(44) \quad \begin{bmatrix} \text{HEAD} & verb\begin{bmatrix} \text{VFORM} & bse \\ \text{MOD} & none \end{bmatrix} \\ \text{SUBJ} & \langle \text{NP} \rangle \\ \text{COMPS} & \langle ..., \text{XP}, ... \rangle \\ \text{CONTENT} & \boxed{1} \end{bmatrix} \implies$$

---

[23] In the case of bounded relativization, the grammatical role of the gap does not necessarily correspond to the RELATIVIZED feature in which it takes place since the rule in (41) (i.e. object relativization when the subject is nominative) places the argument it relativizes in the RELATIVIZED|SPC set of the output entry even though it is a non-subject argument appearing in the COMPS list of the input entry. However, all the rules that deal with relativization in embedded phrases (Section 5.1.3) place the arguments they relativize in the corresponding RELATIVIZED set. Hence, in the case of unbounded relativization, an element in the INHER|RELATIVIZED|SPC set corresponds to a subject gap, whereas one in the INHER|RELATIVIZED|OPC set corresponds to a non-subject gap.

[24] Notice the correspondence between these categories and the ones that the rules in Section 5.1.3 apply to.

$$
\begin{bmatrix}
\text{HEAD} & verb\begin{bmatrix} \text{VFORM } o-part \\[4pt] \text{MOD} & \text{N}'[\text{TO-BIND}|\text{RELATIVIZED}|\text{Y}\left\{\boxed{2}_{\boxed{4}}\right\}] : \begin{bmatrix}\text{INDEX } \boxed{4} \\ \text{RESTR } \boxed{3}\end{bmatrix} \end{bmatrix} \\[20pt]
\begin{array}{l}\text{SUBJ} \\ \text{COMPS}\end{array} & \begin{array}{l}\langle \text{NP}[gen]\rangle \\ \langle ..., \text{XP}[\text{INHER}|\text{RELATIVIZED}|\text{Y}\{\boxed{2}\}], ...\rangle\end{array} \\[16pt]
\text{CONTENT} & \begin{bmatrix}\text{INDEX } \boxed{4} \\ \text{RESTR } \{\boxed{1}\} \bigcup \boxed{3}\end{bmatrix}
\end{bmatrix}
$$

$\text{XP} \in \{\text{NP}, \text{PP}, \text{S}[nominalization], \text{VP}[inf]\} \qquad \text{Y} \in \{\text{SPC}, \text{OPC}\}$

Consider now the example of long distance relativization given in (45), where the possessor of the embedded NP has been relativized. The structure of this example is given in (46). Note that the lexical entry for the *o-part* verb *gördüğün* in this structure is the output of the rule in (44), where the gap host (XP) is an NP (a possessive nominal compound) and the grammatical role of the gap is subject (hence, Y is SPc). The lexical entry for the noun *kitabını* is the output of the rule in (64),[25] which deals with relativization of possessors in possessive nominal compounds.[26] The nonempty INHER|RELATIVIZED|SPC value introduced by this lexical entry is passed on the mother NP node by the Nonlocal Feature Principle. Hence, the only element in the COMPS list of the *o-part* verb *gördüğün* has a nonempty value for one of the INHER|RELATIVIZED features (SPC in this case) in accordance with the relevant constraint imposed by the rule in (44). The CONTENT|RESTR value of the lexical entry for *kitabını* contains two psoas, one of them being a *possess* relation.[27] The structure-sharing (tag $\boxed{5}$) of the INDEX values of the head noun and the element in the TO-BIND|RELATIVIZED|SPC value of the head noun (hence, the element in the INHER|RELATIVIZED|SPC value of the lexical entry for *kitabını*), makes sure that the POSSESSOR role of the *possess* relation is filled by this index since it is the index of the subject (possessor) NP in the original lexical entry for *kitabını*, which has been relativized by the rule in (64). Observe that, in accordance with the Semantics Principle, the content value of the relative clause, which is structure-shared with the content value of the participle (i.e. the head daughter of the relative clause), is also structure-shared with that of the mother NP since the relative clause is the adjunct daughter of this NP.

(45)   [sen-in   [__$_i$ kitab-ı-nı]   gör-düğ-ün]   adam$_i$
         you-GEN   book-3sPoss-ACC see-OPc-2sPoss man

         'the man whose book you saw'

XP = NP (possessive nominal compound)
Y = SPC

---

[25] The examples in this section refer to some of the lexical rules in the next section (Section 5.1.3). We prefer to present these two sections in this order since the following section has references to this section as well and it would be much more difficult to follow the subject in the other order.

[26] In fact, this entry has gone through another lexical rule, which has affixed the accusative case suffix to its PHON value and changed its CASE value from *nominative* to *accusative*. We prefer to omit such inessential details in the discussion here.

[27] Recall from Section 3.2 that this relation is introduced by the lexical rule which deals with possessive suffix affixation to nouns.

(46)

$$
\text{NP} \quad \begin{bmatrix} \text{CONTENT: } \boxed{10} \\ \text{INHER}|\text{RELAT}|\text{SPC: } \{\} \end{bmatrix}
$$

S
$$
\begin{bmatrix} \text{CAT: } \begin{bmatrix} \text{HEAD: } \boxed{3} \\ \text{SUBJ: } \langle\rangle \\ \text{COMPS: } \langle\rangle \end{bmatrix} \\ \text{CONTENT: } \boxed{10} \\ \text{INHER}|\text{RELAT}|\text{SPC: } \{\boxed{4}\} \end{bmatrix}
$$

$\boxed{6}$ N′
$$
\begin{bmatrix} \text{CONTENT: } \begin{bmatrix} \text{INDEX: } \boxed{5} \\ \text{RESTR: } \boxed{11} \end{bmatrix} \\ \text{TO-BIND}|\text{RELAT}|\text{SPC: } \{\boxed{4}\,\boxed{5}\} \end{bmatrix}
$$

adam
man

$\boxed{1}$ NP[*gen*] $\boxed{9}$

sen-in
you-GEN

$\boxed{2}$ NP[*acc*]
$$
\begin{bmatrix} \text{CONTENT: } \boxed{8} \\ \text{INHER}|\text{RELAT}|\text{SPC: } \{\boxed{4}\} \end{bmatrix}
$$

N[*acc*]
$$
\begin{bmatrix} \text{CAT}|\text{SUBJ: } \langle\rangle \\ \text{CONTENT: } \boxed{8} \begin{bmatrix} \text{INDEX: } \boxed{7} \\ \text{RESTR: } \{ \begin{bmatrix} possess \\ \text{POSSESSOR: } \boxed{5} \\ \text{POSSESSED: } \boxed{7} \end{bmatrix}, \begin{bmatrix} book \\ \text{INSTANCE: } \boxed{7} \end{bmatrix} \} \end{bmatrix} \\ \text{INHER}|\text{RELAT}|\text{SPC: } \{\boxed{4}\} \end{bmatrix}
$$

kitab-ı-nı
book-3sPoss-ACC

V
$$
\begin{bmatrix} \text{CAT: } \begin{bmatrix} \text{HEAD: } \boxed{3}\ verb \begin{bmatrix} \text{VFORM: } o\text{-}part \\ \text{MOD: } \boxed{6} \end{bmatrix} \\ \text{SUBJ: } \langle\boxed{1}\rangle \\ \text{COMPS: } \langle\boxed{2}\rangle \end{bmatrix} \\ \text{CONTENT: } \boxed{10} \begin{bmatrix} \text{INDEX: } \boxed{5} \\ \text{RESTR: } \{ \begin{bmatrix} see \\ \text{SEER: } \boxed{9} \\ \text{SEEN: } \boxed{7} \end{bmatrix} \} \cup \boxed{11} \end{bmatrix} \end{bmatrix}
$$

gör-düğ-ün
see-OPc-2sPoss

Let us now consider another example, (47), where the gap host (XP) is an NP modified by a relative clause. (48) shows the structure of this clause. Note that the lexical entry for the *o-part* verb *okuduğu* in this structure is the output of the consecutive applications of the following lexical rules of relativization that we have seen in the previous sections:

(i) The lexical rule in (38) has applied to the lexical entry for the *base* verb *oku*, producing an output entry (an *o-part* verb) where the direct object has been relativized. Note how the constraints this lexical rule imposes on the VFORM, MOD, CONTENT, COMPS and INHER|RELATIVIZED|OPC values of the output have been illustrated in the structure of the embedded relative clause (which is in fact very similar to the structure of (39) given in (40) as far as these features are concerned).

(ii) The output entry of the above application (which is an *o-part* verb) has been an input to the lexical rule in (66), which has relativized its subject (placing it in the INHER|RELATIVIZED|SPC value of the final output, that is, the one we see as the lexical entry of *okuduğu* in (48)).

On the mother NP node of the embedded relative clause the nonempty INHER|RELATIVIZED|OPC value introduced by the lexical entry of the *o-part* verb *okuduğu*, no longer shows up since it has been bound off by the TO-BIND|RELATIVIZED|OPC value of the head noun of this relative clause. However, the nonempty INHER|RELATIVIZED|SPC value, which has been introduced by the same lexical entry, still survives. Hence, the only element in the COMPS list of the *o-part* verb *bildiği* (which is the output of the lexical rule in (44)) has a nonempty value for one of the INHER|RELATIVIZED features (SPC in this case) satisfying the relevant constraint imposed by the rule in (44). Note that the READER role of the *read* relation in the CONTENT|RESTR value of the embedded participle *okuduğu* is filled by the INDEX of the head noun of the outer relative clause (tag ⑤) since this is the index of the subject NP of the output *okuduğu* of the rule in (38) (cf. (i) above), which has then been relativized by the rule in (66) (cf. (ii) above).

(47)   [kadın-ın   [—$_j$ —$_i$ oku-duğ-u]   kitab-ı$_i$ bil-diğ-i]   adam$_j$
       woman-GEN   read-OPc-3sPoss book-ACC know-OPc-3sPoss man

       'the man that the woman knows the book he reads'

XP = NP (modified by a relative clause),
Y = SPC

(48)

NP

$$\begin{bmatrix} \text{CONTENT:} & \boxed{13} \\ \text{INHER|RELAT|SPC:} & \{\} \end{bmatrix}$$

S

$$\begin{bmatrix} \text{CAT:} & \begin{bmatrix} \text{HEAD:} & \boxed{10} \\ \text{SUBJ:} & \langle\rangle \\ \text{COMPS:} & \langle\rangle \end{bmatrix} \\ \text{CONTENT:} & \boxed{13} \\ \text{INHER|RELAT|SPC:} & \{\boxed{2}\} \end{bmatrix}$$

$\boxed{6}$ N$'$

$$\begin{bmatrix} \text{CONTENT:} & \begin{bmatrix} \text{INDEX:} & \boxed{5} \\ \text{RESTR:} & \boxed{14} \end{bmatrix} \\ \text{TO-BIND|RELAT|SPC:} & \langle\boxed{2}\boxed{5}\} \end{bmatrix}$$

adam
man

$\boxed{1}$ NP[*gen*] $\boxed{15}$

kadın-ın
woman-GEN

$\boxed{7}$ NP

$$\begin{bmatrix} \text{CONTENT:} & \boxed{11} \\ \text{INHER|RELAT:} & \begin{bmatrix} \text{SPC:} & \{\boxed{2}\} \\ \text{OPC:} & \{\} \end{bmatrix} \end{bmatrix}$$

V

$$\begin{bmatrix} \text{CAT:} & \begin{bmatrix} \text{HEAD:} & \boxed{10}\ verb & \begin{bmatrix} \text{VFORM:} & o\text{-}part \\ \text{MOD:} & \boxed{6} \end{bmatrix} \\ \text{SUBJ:} & \langle\boxed{1}\rangle \\ \text{COMPS:} & \langle\boxed{7}\rangle \end{bmatrix} \\ \text{CONTENT:} & \boxed{13} \begin{bmatrix} \text{INDEX:} & \boxed{5} \\ \text{RESTR:} & \{ \begin{bmatrix} know \\ \text{KNOWER:} & \boxed{15} \\ \text{KNOWN:} & \boxed{8} \end{bmatrix} \} \bigcup \boxed{14} \end{bmatrix} \end{bmatrix}$$

bil-diğ-i
know-OPc-3sPoss

S

$$\begin{bmatrix} \text{CAT|HEAD:} & \boxed{9} \\ \text{CONTENT:} & \boxed{11} \\ \text{INHER|RELAT:} & \begin{bmatrix} \text{SPC:} & \{\boxed{2}\} \\ \text{OPC:} & \{\boxed{4}\} \end{bmatrix} \end{bmatrix}$$

$\boxed{3}$ N$'$

$$\begin{bmatrix} \text{CONTENT:} & \begin{bmatrix} \text{INDEX:} & \boxed{8} \\ \text{RESTR:} & \boxed{12} \end{bmatrix} \\ \text{TO-BIND|RELAT|OPC:} & \{\boxed{4}\boxed{8}\} \end{bmatrix}$$

kitab-ı
book-ACC

V

$$\begin{bmatrix} \text{CAT:} & \begin{bmatrix} \text{HEAD:} & \boxed{9}\ verb & \begin{bmatrix} \text{VFORM:} & o\text{-}part \\ \text{MOD:} & \boxed{3} \end{bmatrix} \\ \text{SUBJ:} & \langle\rangle \\ \text{COMPS:} & \langle\rangle \end{bmatrix} \\ \text{CONTENT:} & \boxed{11} \begin{bmatrix} \text{INDEX:} & \boxed{8} \\ \text{RESTR:} & \{ \begin{bmatrix} read \\ \text{READER:} & \boxed{5} \\ \text{READ:} & \boxed{8} \end{bmatrix} \} \bigcup \boxed{12} \end{bmatrix} \\ \text{INHER|RELAT:} & \begin{bmatrix} \text{SPC:} & \{\boxed{2}\} \\ \text{OPC:} & \{\boxed{4}\} \end{bmatrix} \end{bmatrix}$$

oku-duğ-u
read-OPc-3sPoss

Non-subject Gap Host – Nominative Subject (16aii)

The lexical rule in (49) deals with the case described in (16aii), in which the gap host is a non-subject constituent and there is no *genitive* subject in the clause. The VFORM value of the output is *s-part* since, in this case, the SPc strategy must be used. Recall that we do not provide an account for relativization in *impersonal passives* in this paper. Hence, the SUBJ value of the output (which in the case of *impersonal passives* would be empty) is constrained to contain an NP which is *nominative* and *nonspecific*. The rest of the constraints imposed by this lexical rule are exactly the same as the ones imposed by the lexical rule in (44), which takes care of the case in (16ai).

$$(49) \quad \begin{bmatrix} \text{HEAD} & verb\begin{bmatrix} \text{VFORM } bse \\ \text{MOD} & none \end{bmatrix} \\ \text{SUBJ} & \langle \text{NP} \rangle \\ \text{COMPS} & \langle ..., \text{XP}, ... \rangle \\ \text{CONTENT } \boxed{1} \end{bmatrix} \implies$$

$$\begin{bmatrix} \text{HEAD} & verb\begin{bmatrix} \text{VFORM } s-part \\ \text{MOD} & \text{N}'[\text{TO-BIND}|\text{RELATIVIZED}|\text{Y} \left\{ \boxed{2}_{\boxed{4}} \right\}] : \begin{bmatrix} \text{INDEX } \boxed{4} \\ \text{RESTR } \boxed{3} \end{bmatrix} \end{bmatrix} \\ \text{SUBJ} & \langle \text{NP}[nom, nonspecific] \rangle \\ \text{COMPS} & \langle ..., \text{XP}[\text{INHER}|\text{RELATIVIZED}|\text{Y} \{ \boxed{2} \}], ... \rangle \\ \text{CONTENT} & \begin{bmatrix} \text{INDEX } \boxed{4} \\ \text{RESTR } \{\boxed{1}\} \bigcup \boxed{3} \end{bmatrix} \end{bmatrix}$$

$\text{XP} \in \{\text{NP}, \text{PP}, \text{S}[nominalization], \text{VP}[infl]\}$, $\text{Y} \in \{\text{SPC}, \text{OPC}\}$

Let us now consider some examples to illustrate how this rule works. The first example, given in (50), is one where the gap host is a *fact* type nominalization phrase which acts as the accusative object of the relative clause (XP is S[*fact*]), and the grammatical role of the gap is subject (Y is SPC). (51) shows the structure for this example. The lexical entry for the *fact* verb *söylediğini* is the output of the rule in (67), which has relativized its subject. The nonempty INHER|RELTIVIZED|SPC value introduced by this entry is passed on to the mother S node. Hence, the element in the SUBJ list of the lexical entry for the *s-part* verb *yazan* has a nonempty value for one of the INHER|RELTIVIZED features (SPC in this case), satisfying the relevant constraint imposed by the rule in (49). The rest of the structure is very similar to the ones in the previous section, except that the subject of the relative clause is *nominative* and *nonspecific* in this case.

(50)   [[_*i* bu söz-ü   söyle-diğ-i-ni]   gazete   yaz-an]   başbakan*i*
          this word-ACC say-FACT-3sPoss-ACC newspaper write-SPc prime minister

      'the prime minister who a newspaper/newspapers reported to have said these words'

XP = S
Y = SPC

(51)

NP
$$\left[\begin{array}{ll}\text{CONTENT:} & \boxed{13} \\ \text{INHER}\,|\,\text{RELAT}\,|\,\text{SPC:} & \{\} \end{array}\right]$$

S
$$\left[\begin{array}{ll}\text{CAT:} & \left[\begin{array}{ll}\text{HEAD:} & \boxed{5} \\ \text{SUBJ:} & \langle\rangle \\ \text{COMPS:} & \langle\rangle\end{array}\right] \\ \text{CONTENT:} & \boxed{13} \\ \text{INHER}\,|\,\text{RELAT}\,|\,\text{SPC:} & \{\,\boxed{2}\,\}\end{array}\right]$$

$\boxed{6}$ N$'$
$$\left[\begin{array}{ll}\text{CONTENT:} & \left[\begin{array}{ll}\text{INDEX:} & \boxed{7} \\ \text{RESTR:} & \boxed{12}\end{array}\right] \\ \text{TO-BIND}\,|\,\text{RELAT}\,|\,\text{SPC:} & \{\,\boxed{2}\,\boxed{7}\,\}\end{array}\right]$$

başbakan
prime minister

$\boxed{4}$ S
$$\left[\begin{array}{ll}\text{CAT:} & \left[\begin{array}{ll}\text{HEAD:} & \boxed{3} \\ \text{COMPS:} & \langle\rangle\end{array}\right] \\ \text{CONTENT:} & \boxed{10} \\ \text{INHER}\,|\,\text{RELAT}\,|\,\text{SPC:} & \{\,\boxed{2}\,\}\end{array}\right]$$

$\boxed{8}$ NP[*nom,nonspecific*] $\boxed{11}$

gazete
newspaper

V
$$\left[\begin{array}{ll}\text{CAT:} & \left[\begin{array}{ll}\text{HEAD:} & \boxed{5}\ \textit{verb} \quad \left[\begin{array}{ll}\text{VFORM:} & \textit{s-part} \\ \text{MOD:} & \boxed{6}\end{array}\right] \\ \text{SUBJ:} & \langle\,\boxed{8}\,\rangle \\ \text{COMPS:} & \langle\,\boxed{4}\,\rangle\end{array}\right] \\ \text{CONTENT:} & \boxed{13}\ \left[\begin{array}{ll}\text{INDEX:} & \boxed{7} \\ \text{RESTR:} & \{\left[\begin{array}{ll}\textit{report} \\ \text{REPORTER:} & \boxed{11} \\ \text{REPORTED:} & \boxed{10}\end{array}\right]\}\cup\boxed{12}\end{array}\right]\end{array}\right]$$

yaz-an
write-SPc

$\boxed{1}$ NP[*acc*] $\boxed{9}$

bu söz-ü
this word-ACC

V
$$\left[\begin{array}{ll}\text{CAT:} & \left[\begin{array}{ll}\text{HEAD:} & \boxed{3}\ \textit{verb} \quad \left[\begin{array}{ll}\text{VFORM:} & \textit{fact} \\ \text{CASE:} & \text{acc}\end{array}\right] \\ \text{SUBJ:} & \langle\rangle \\ \text{COMPS:} & \langle\,\boxed{1}\,\rangle\end{array}\right] \\ \text{CONTENT:} & \boxed{10}\ \left[\begin{array}{ll}\textit{say} \\ \text{SAYER:} & \boxed{7} \\ \text{SAID:} & \boxed{9}\end{array}\right] \\ \text{INHER}\,|\,\text{RELAT}\,|\,\text{SPC:} & \{\,\boxed{2}\,\}\end{array}\right]$$

söyle-diğ-i-ni
say-FACT-3sPoss-ACC

In the next example, (52), the gap host is the accusative object of the relative clause modified by an embedded relative clause (XP is NP), and the grammatical role of the gap is object (Y is OPC). In the structure for this example, given in (53), the lexical entry for the *s-part* verb *yiyen* is the output of the following consecutive applications of two of the lexical rules of relativization:

(i) The lexical rule in (35) has derived the *s-part* verb *yiyen* from the lexical entry of the *base* verb *ye*, relativizing its subject. Note how the constraints imposed by this rule on the VFORM, MOD, CONTENT, SUBJ and INHER|RELATIVIZED|SPC values of the output have been illustrated in the structure of the embedded relative clause (which is in fact very similar to the structure of (36) given in (37) as far as these features are concerned).

(i) This *s-part* verb then has been an input to the lexical rule in (65), which has relativized the element in its COMPS list, placing it in the INHER|RELATIVIZED|OPC list of the output.

On the mother NP node of the embedded relative clause the INHER|RELATIVIZED|SPC value is empty since the nonempty INHER|RELATIVIZED|SPC value introduced by the lexical entry of *yiyen* has been bound off by the TO-BIND|RELATIVIZED|SPC value on the head noun of this relative clause. The INHER|RELATIVIZED|OPC value, on the other hand, is still nonempty. The only element in the COMPS list of the *s-part* verb *sokan* (which is the output of the rule (49)) therefore has a nonempty value for one of the INHER|RELATIVIZED features (OPC in this case).

(52)   [[$—_i$ $—_j$ yi-yen] çocuğ-u$_i$ arı sok-an]   bitki$_j$
              eat-SPc child-ACC bee sting-SPc plant

   'the plant such that the child who ate it was stung by a bee'

XP = NP (modified by a relative clause)
Y = OPC

(53)

NP
[CONTENT: 12
  INHER|RELAT|OPC: {}]

S
[CAT: [HEAD: 10
         SUBJ: ⟨⟩
         COMPS: ⟨⟩]
  CONTENT: 12
  INHER|RELAT|OPC: { 2 }]

6 N′
[CONTENT: [INDEX: 5
             RESTR: 15]
  TO-BIND|RELAT|OPC: { 2 5 }]

bitki
plant

1 NP[*acc*]
[CONTENT: 11
  INHER|RELAT: [SPC: { }
                 OPC: { 2 }]]

7 NP[*nom, nonspecific*] 13

arı
bee

V
[CAT: [HEAD: 10 *verb* [VFORM: *s-part*
                           MOD: 6]
         SUBJ: ⟨ 7 ⟩
         COMPS: ⟨ 1 ⟩]
  CONTENT: 12 [INDEX: 5
                RESTR: { [*sting*
                           STINGER: 13
                           STINGEE: 8] } ∪ 15]]

sok-an
sting-SPc

S
[CAT|HEAD: 9
  CONTENT: 11
  INHER|RELAT: [SPC: { 4 }
                 OPC: { 2 }]]

3 N′[*acc*]
[CONTENT: [INDEX: 8
             RESTR: 14]
  TO-BIND|RELAT|SPC: { 4 8 }]

çocuğ-u
child-ACC

V
[CAT: [HEAD: 9 *verb* [VFORM: *s-part*
                          MOD: 3]
         SUBJ: ⟨⟩
         COMPS: ⟨⟩]
  CONTENT: 11 [INDEX: 8
                RESTR: { [*eat*
                          EATER: 8
                          EATEN: 5] } ∪ 14]
  INHER|RELAT: [SPC: { 4 }
                 OPC: { 2 }]]

yi-yen
eat-SPc

Subject Gap Host – Subject Gap (16bi)

Let us now discuss the formulation of the third case in (16), i.e. the case where the gap host is the subject of the relative clause and the grammatical role of the gap is also subject. Recall that in the first two cases of (16) (i.e. (16a), where the gap host is a non-subject constituent of the outer clause), it is only the existence of a genitive subject in the outer clause that determines the strategy to be used. In other words, the grammatical role of the gap has no effect at all on this choice. That is why there is a variable Y, ranging over the set {SPC, OPC} in the lexical rules (44) and (49). In (16b), on the other hand, it is mainly the grammatical role of the gap that determines the relativization strategy to be used on the outer relative clause: if the grammatical role of the gap is subject, then the subject of the relative clause (the gap host) is left unmarked and the SPc strategy is used (see (16bi)). Otherwise, the subject of the clause is marked genitive and the OPc strategy is used (see (16bii)).

The former case (16bi) is handled by the lexical rule (54). The VFORM value of the output is *s-part* since the SPc strategy must be used in this case. Note that since the gap host is subject and the grammatical role of the gap is also subject, the rule places a constraint on the element in the SUBJ list of the output forcing it to have a nonempty INHER|RELATIVIZED|SPC value. The element in this nonempty set is further structure-shared with the element in the TO-BIND|RELATIVIZED|SPC value of the head noun (tag ②) to bind this long distance dependency off once the head noun combines with the relative clause headed by this participle. The syntactic category of the gap host can be an NP, or a PP or an S[*nominalization*]. Note that VP[*inf*], which occurs in the list of the possible syntactic categories for the gap host in the lexical rules in (44) and (49), is excluded from this list in (54) since it is not possible to relativize a constituent in a subject infinitive phrase (see Sezer (1986) for a discussion on this restriction). The CONTENT value of the output is exactly the same as that of the outputs of the other participle derivation rules.

$$
(54) \quad
\begin{bmatrix}
\text{HEAD} & verb\begin{bmatrix}\text{VFORM} & bse \\ \text{MOD} & none\end{bmatrix} \\
\text{SUBJ} & \langle \text{XP} \rangle \\
\text{CONTENT} & \boxed{1}
\end{bmatrix}
\implies
$$

$$
\begin{bmatrix}
\text{HEAD} & verb\begin{bmatrix}\text{VFORM} & s-part \\ \text{MOD} & \text{N}'[\text{TO-BIND}|\text{RELATIVIZED}|\text{SPC} \{\boxed{2}\boxed{4}\}] : \begin{bmatrix}\text{INDEX} & \boxed{4} \\ \text{RESTR} & \boxed{3}\end{bmatrix}\end{bmatrix} \\
\text{SUBJ} & \langle \text{XP}[nom, \text{INHER}|\text{RELATIVIZED}|\text{SPC} \{\boxed{2}\}] \rangle \\
\text{CONTENT} & \begin{bmatrix}\text{INDEX} & \boxed{4} \\ \text{RESTR} & \{\boxed{1}\} \bigcup \boxed{3}\end{bmatrix}
\end{bmatrix}
$$

XP $\in$ {NP, S[*nominalization*], PP}

Consider now the example in (55), where the possessor of the embedded subject NP has been relativized. In the structure for this example, given in (57), the lexical entry for the *s-part* verb *seven* is the output of the rule in (54), where the gap host is an NP. The lexical entry for the noun *köpeği*, on the other hand, is the output of the rule in (64), which has relativized the subject (possessor) of the input placing it in the INHER|RELATIVIZED|SPC value of this output entry. This nonempty INHER|RELATIVIZED|SPC value is passed on the mother NP node. The element in the SUBJ list of *seven* therefore has a nonempty INHER|RELATIVIZED|SPC value, in line with the relevant constraint imposed by the rule (54).

(55)   [[$\_\_i$ köpeğ-i]   sen-i   sev-en] adam$_i$
              dog-3sPoss you-ACC love-SPc man

          'the man whose dog loves you'

XP = NP (possessive nominal compound)

Another example in relation to the rule in (54) is given in (56), and its structure in (58). The gap host in this case is the subject NP, modified by a relative clause. The *o-part* verb *aldığı*, which is the head of the embedded relative clause, is the output of the consecutive applications of the rules (38) and (66), exactly like the *o-part* verbal head of the embedded relative clause in (48) (page 100). The *s-part* verb *bozuk çıkan* in the outer relative clause, on the other hand, is the output of the rule in (54).

(56)   [[$\_\_j$ $\_\_i$ al-dığ-ı]   araba$_i$ bozuk   çık-an]   adam$_j$
              buy-OPc-3sPoss car   defective turn out-SPc man

          'the man who the car that he bought turned out to be defective'

XP = NP (modified by a relative clause)

(57)

NP
$\begin{bmatrix} \text{CONTENT: } \boxed{9} \\ \text{INHER}|\text{RELAT}|\text{SPC: } \{\} \end{bmatrix}$

S
$\begin{bmatrix} \text{CAT: } \begin{bmatrix} \text{HEAD: } \boxed{3} \\ \text{SUBJ: } \langle \rangle \\ \text{COMPS: } \langle \rangle \end{bmatrix} \\ \text{CONTENT: } \boxed{9} \\ \text{INHER}|\text{RELAT}|\text{SPC: } \{ \boxed{4} \} \end{bmatrix}$

$\boxed{6}$ N′
$\begin{bmatrix} \text{CONTENT: } \begin{bmatrix} \text{INDEX: } \boxed{5} \\ \text{RESTR: } \boxed{10} \end{bmatrix} \\ \text{TO-BIND}|\text{RELAT}|\text{SPC: } \{ \boxed{4} \boxed{5} \} \end{bmatrix}$

adam
man

$\boxed{1}$ NP[nom]
$\begin{bmatrix} \text{CONTENT: } \boxed{7} \\ \text{INHER}|\text{RELAT}|\text{SPC: } \{ \boxed{4} \} \end{bmatrix}$

$\boxed{2}$ NP[acc] $\boxed{8}$

sen-i
you-ACC

V
$\begin{bmatrix} \text{CAT: } \begin{bmatrix} \text{HEAD: } \boxed{3} \; verb & \begin{bmatrix} \text{VFORM: } s\text{-}part \\ \text{MOD: } \boxed{6} \end{bmatrix} \\ \text{SUBJ: } \langle \boxed{1} \rangle \\ \text{COMPS: } \langle \boxed{2} \rangle \end{bmatrix} \\ \text{CONTENT: } \boxed{9} \begin{bmatrix} \text{INDEX: } \boxed{5} \\ \text{RESTR: } \{ \begin{bmatrix} see \\ \text{LOVER: } \boxed{6} \\ \text{LOVED: } \boxed{8} \end{bmatrix} \} \cup \boxed{10} \end{bmatrix} \end{bmatrix}$

N[nom]
$\begin{bmatrix} \text{CAT}|\text{SUBJ: } \langle \rangle \\ \text{CONTENT: } \boxed{7} \begin{bmatrix} \text{INDEX: } \boxed{6} \\ \text{RESTR: } \{ \begin{bmatrix} possess \\ \text{POSSESSOR: } \boxed{5} \\ \text{POSSESSED: } \boxed{6} \end{bmatrix} , \begin{bmatrix} dog \\ \text{INSTANCE: } \boxed{6} \end{bmatrix} \} \end{bmatrix} \\ \text{INHER}|\text{RELAT}|\text{SPC: } \{ \boxed{4} \} \end{bmatrix}$

köpeğ-i
dog-3sPoss

sev-en
love-SPc

(58)

NP
$$\begin{bmatrix} \text{CONTENT: } \boxed{11} \\ \text{INHER|RELAT|SPC: } \{\} \end{bmatrix}$$

S
$$\begin{bmatrix} \text{CAT: } \begin{bmatrix} \text{HEAD: } \boxed{9} \\ \text{SUBJ: } \langle\rangle \end{bmatrix} \\ \text{CONTENT: } \boxed{11} \\ \text{INHER|RELAT|SPC: } \{\boxed{2}\} \end{bmatrix}$$

$\boxed{6}$ N′
$$\begin{bmatrix} \text{CONTENT: } \begin{bmatrix} \text{INDEX: } \boxed{5} \\ \text{RESTR: } \boxed{12} \end{bmatrix} \\ \text{TO-BIND|RELAT|SPC: } \{\boxed{2}\boxed{5}\} \end{bmatrix}$$

adam
man

$\boxed{1}$ NP
$$\begin{bmatrix} \text{CONTENT: } \boxed{9} \\ \text{INHER|RELAT: } \begin{bmatrix} \text{SPC: } \{\boxed{2}\} \\ \text{OPC: } \{\} \end{bmatrix} \end{bmatrix}$$

V
$$\begin{bmatrix} \text{CAT: } \begin{bmatrix} \text{HEAD: } \boxed{9}\ verb \begin{bmatrix} \text{VFORM: } s\text{-}part \\ \text{MOD: } \boxed{6} \end{bmatrix} \\ \text{SUBJ: } \langle\boxed{1}\rangle \end{bmatrix} \\ \text{CONTENT: } \boxed{11} \begin{bmatrix} \text{INDEX: } \boxed{5} \\ \text{RESTR: } \{\begin{bmatrix} turn - defective \\ \text{DEFECTIVE: } \boxed{8} \end{bmatrix}\} \bigcup \boxed{12} \end{bmatrix} \end{bmatrix}$$

bozuk çık-an
turn out to be defective-SPc

S
$$\begin{bmatrix} \text{CAT|HEAD: } \boxed{7} \\ \text{CONTENT: } \boxed{9} \\ \text{INHER|RELAT: } \begin{bmatrix} \text{SPC: } \{\boxed{2}\} \\ \text{OPC: } \{\boxed{4}\} \end{bmatrix} \end{bmatrix}$$

$\boxed{3}$ N′
$$\begin{bmatrix} \text{CONTENT: } \begin{bmatrix} \text{INDEX: } \boxed{8} \\ \text{RESTR: } \boxed{10} \end{bmatrix} \\ \text{TO-BIND|RELAT|OPC: } \{\boxed{4}\boxed{8}\} \end{bmatrix}$$

araba
car

V
$$\begin{bmatrix} \text{CAT: } \begin{bmatrix} \text{HEAD: } \boxed{7}\ verb \begin{bmatrix} \text{VFORM: } o\text{-}part \\ \text{MOD: } \boxed{3} \end{bmatrix} \\ \text{SUBJ: } \langle\rangle \\ \text{COMPS: } \langle\rangle \end{bmatrix} \\ \text{CONTENT: } \boxed{9} \begin{bmatrix} \text{INDEX: } \boxed{8} \\ \text{RESTR: } \{\begin{bmatrix} buy \\ \text{BUYER: } \boxed{5} \\ \text{BOUGHT: } \boxed{8} \end{bmatrix}\} \bigcup \boxed{10} \end{bmatrix} \\ \text{INHER|RELAT: } \begin{bmatrix} \text{SPC: } \{\boxed{2}\} \\ \text{OPC: } \{\boxed{4}\} \end{bmatrix} \end{bmatrix}$$

al-dığ-ı
buy-OPc-3sPoss

Subject Gap Host – Non-subject Gap (16bii)

We now come to the last case in (16), i.e. the one in which the gap host is the subject of the outer relative clause, and the grammatical role of the gap is non-subject. Recall that in this case the subject of the relative clause (the gap host) is marked genitive and the OPc strategy is used (cf. page 105). This case is handled by the rule in (59). This rule is very similar to the rule in (54), except that the VFORM value of the output is *o-part* since the OPc strategy is to be used, that the subject is *genitive*, and that the INHER|RELATIVIZED|OPC value of the element in the SUBJ list of the output is nonempty, instead of the SPC value (and consequently the TO-BIND|RELATIVIZED|OPC value of the head noun), since the gap is a non-subject gap. VP[*inf*] is again excluded from the list of the possible syntactic categories for the gap host (XP) as in the case of the rule in (54).

$$
(59) \quad
\begin{bmatrix}
\text{HEAD} & verb\begin{bmatrix}\text{VFORM } bse \\ \text{MOD} \quad none\end{bmatrix} \\
\text{SUBJ} & \langle \text{XP} \rangle \\
\text{CONTENT} & \boxed{1}
\end{bmatrix}
\implies
$$

$$
\begin{bmatrix}
\text{HEAD} & verb\begin{bmatrix}\text{VFORM } o-part \\ \text{MOD} \quad \text{N}'[\text{TO-BIND}|\text{RELATIVIZED}|\text{OPC } \{\boxed{2}\boxed{4}\}] : \begin{bmatrix}\text{INDEX } \boxed{4} \\ \text{RESTR } \boxed{3}\end{bmatrix}\end{bmatrix} \\
\text{SUBJ} & \langle \text{XP}[gen, \text{INHER}|\text{RELATIVIZED}|\text{OPC } \{\boxed{2}\}] \rangle \\
\text{CONTENT} & \begin{bmatrix}\text{INDEX } \boxed{4} \\ \text{RESTR } \{\boxed{1}\} \bigcup \boxed{3}\end{bmatrix}
\end{bmatrix}
$$

XP ∈ {NP, S[*nominalization*], PP}

Consider now the example in (60), and its structure in (61). Note that the gap host in this case is an *act* type nominalization phrase, which is the *genitive* subject of the relative clause. The *act* verb *tanımasının* in this sentential subject is the output of the rule in (68), hence its object has been relativized. The *o-part* verb *beklendiği* in the relative clause, on the other hand, is the output of the rule in (59).

(60) [[adam-ın $\_i$ tanı-ma-sı-nın]   bekle-n-diğ-i]   kadın$_i$
man-GEN   know-ACT-3sPoss-GEN expect-PASS-OPc-3sPoss woman

'the woman such that it is expected that the man knows her'[28]

XP = S

---

[28] Recall from Section 3.3 that in the case of relativization in nominalization phrases, when the gap host is the subject of the clause and the grammatical role of the gap is non-subject, it is not necessarily the case that the OPc strategy must be used (cf. (23)). Recall also that this is a problem with the relativization pattern in (16). In order to get around this problem within the HPSG analysis, we propose an additional lexical rule which derives an *s-part* verb from a *base* verb when the gap host is a subject nominalization phrase and the grammatical role of the gap is object, hence the INHER|RELATIVIZED|OPC value of the gap host is nonempty (not SPC). This rule is exactly the same as the one in (59), except that the subject (i.e. the gap host) is constrained to be an S[*nominalization*], that the VFORM value of the output is constrained to be *s-part* (not *o-part*), and that the subject of the output is constrained to be *nominative* (not *genitive*). This rule derives *s-part* verbs like *beklenen*, which licences a structure for (i) that is exactly the same as (61), except that the *act* phrase gap host (headed by the *act* verb *tanıması*) is nominative and the head of the relative clause is the

(61)

NP
$$\begin{bmatrix} \text{CONTENT:} & \boxed{10} \\ \text{INHER|RELAT|OPC:} & \{\} \end{bmatrix}$$

S
$$\begin{bmatrix} \text{CAT:} & \begin{bmatrix} \text{HEAD:} & \boxed{5} \\ \text{SUBJ:} & \langle\rangle \end{bmatrix} \\ \text{CONTENT:} & \boxed{10} \\ \text{INHER|RELAT|OPC:} & \{\boxed{2}\} \end{bmatrix}$$

$\boxed{6}$ N′
$$\begin{bmatrix} \text{CONTENT:} & \begin{bmatrix} \text{INDEX:} & \boxed{7} \\ \text{RESTR:} & \boxed{11} \end{bmatrix} \\ \text{TO-BIND|RELAT|OPC:} & \{\boxed{2}\ \boxed{7}\} \end{bmatrix}$$

kadın
woman

$\boxed{4}$ S
$$\begin{bmatrix} \text{CAT:} & \begin{bmatrix} \text{HEAD:} & \boxed{3} \\ \text{SUBJ:} & \langle\rangle \end{bmatrix} \\ \text{CONTENT:} & \boxed{8} \\ \text{INHER|RELAT|OPC:} & \{\boxed{2}\} \end{bmatrix}$$

V
$$\begin{bmatrix} \text{CAT:} & \begin{bmatrix} \text{HEAD:} & \boxed{5}\ \textit{verb} & \begin{bmatrix} \text{VFORM:} & \textit{o-part} \\ \text{MOD:} & \boxed{6} \end{bmatrix} \\ \text{SUBJ:} & \langle\boxed{4}\rangle \end{bmatrix} \\ \text{CONTENT:} & \boxed{10} \quad \begin{bmatrix} \text{INDEX:} & \boxed{7} \\ \text{RESTR:} & \{\begin{bmatrix} \textit{expect} \\ \text{EXPECTER:} \\ \text{EXPECTED:} & \boxed{8} \end{bmatrix}\} \bigcup \boxed{11} \end{bmatrix} \end{bmatrix}$$

bekle-n-diğ-i
expect-PASS-OPc-3sPoss

$\boxed{1}$ NP[*gen*] $\boxed{9}$

adam-ın
man-GEN

V
$$\begin{bmatrix} \text{CAT:} & \begin{bmatrix} \text{HEAD:} & \boxed{3}\ \textit{verb} & \begin{bmatrix} \text{VFORM:} & \textit{act} \\ \text{CASE:} & \textit{gen} \end{bmatrix} \\ \text{SUBJ:} & \langle\boxed{1}\rangle \\ \text{COMPS:} & \langle\rangle \end{bmatrix} \\ \text{CONTENT:} & \boxed{8}\quad \begin{bmatrix} \textit{know} \\ \text{KNOWER:} & \boxed{9} \\ \text{KNOWN:} & \boxed{7} \end{bmatrix} \\ \text{INHER|RELAT|OPC:} & \{\boxed{2}\} \end{bmatrix}$$

tanı-ma-sı-nın
know-ACT-3sPoss-GEN

A second example with regard to the rule in (59) is given in (62), and its structure in (63). The *s-part* verb *kullanan* in this structure (the head of the embedded relative clause) is the output of the consecutive applications of the rules in (35) and (65), just like the *s-part* verb *yiyen* in (53) (page 104). The *o-part* verb *çıldırdığı* in the outer clause, on the other hand, is the output of the rule in (59).

(62)   [[—$_i$ —$_j$ kullan-an] pilot-un$_i$ çıldır-dığ-ı]   uçak$_j$
             fly-SPc   pilot-GEN go crazy-OPc-3sPoss plane

'the plane which the pilot who was flying it went crazy'

XP = NP (modified by a relative clause)

---

s-part verb *beklenen* (derived by the above rule).

(i)   [[adam-ın —$_i$ tanı-ma-sı]   bekle-n-en]   kadın$_i$
           man-GEN   know-ACT-3sPoss expect-PASS-SPc woman
           'the woman such that it is expected that the man knows her'

(63)

NP
$$\begin{bmatrix} \text{CONTENT:} & \boxed{12} \\ \text{INHER|RELAT|OPC:} & \{\} \end{bmatrix}$$

S
$$\begin{bmatrix} \text{CAT:} & \begin{bmatrix} \text{HEAD:} & \boxed{9} \\ \text{SUBJ:} & \langle\rangle \end{bmatrix} \\ \text{CONTENT:} & \boxed{12} \\ \text{INHER|RELAT|OPC:} & \{\boxed{2}\} \end{bmatrix}$$

$\boxed{6}$ N′
$$\begin{bmatrix} \text{CONTENT:} & \begin{bmatrix} \text{INDEX:} & \boxed{5} \\ \text{RESTR:} & \boxed{13} \end{bmatrix} \\ \text{TO-BIND|RELAT|OPC:} & \{\boxed{2}\boxed{5}\} \end{bmatrix}$$
uçak
plane

$\boxed{1}$ NP[*gen*]
$$\begin{bmatrix} \text{CONTENT:} & \boxed{10} \\ \text{INHER|RELAT:} & \begin{bmatrix} \text{SPC:} & \{\} \\ \text{OPC:} & \{\boxed{2}\} \end{bmatrix} \end{bmatrix}$$

V
$$\begin{bmatrix} \text{CAT:} & \begin{bmatrix} \text{HEAD:} & \boxed{9}\ verb\ \begin{bmatrix} \text{VFORM:} & \textit{o-part} \\ \text{MOD:} & \boxed{6} \end{bmatrix} \\ \text{SUBJ:} & \langle\boxed{1}\rangle \end{bmatrix} \\ \text{CONTENT:} & \boxed{12}\ \begin{bmatrix} \text{INDEX:} & \boxed{5} \\ \text{RESTR:} & \{\begin{bmatrix} gocrazy \\ \text{CRAZY:} & \boxed{5} \end{bmatrix}\} \cup \boxed{13} \end{bmatrix} \end{bmatrix}$$
çıldır-dığ-ı
go crazy-OPc-3sPoss

S
$$\begin{bmatrix} \text{CAT|HEAD:} & \boxed{7} \\ \text{CONTENT:} & \boxed{10} \\ \text{INHER|RELAT:} & \begin{bmatrix} \text{SPC:} & \{\boxed{4}\} \\ \text{OPC:} & \{\boxed{2}\} \end{bmatrix} \end{bmatrix}$$

$\boxed{3}$ N′[*gen*]
$$\begin{bmatrix} \text{CONTENT:} & \begin{bmatrix} \text{INDEX:} & \boxed{8} \\ \text{RESTR:} & \boxed{11} \end{bmatrix} \\ \text{TO-BIND|RELAT|SPC:} & \{\boxed{4}\boxed{8}\} \end{bmatrix}$$
pilot-un
pilot-GEN

V
$$\begin{bmatrix} \text{CAT:} & \begin{bmatrix} \text{HEAD:} & \boxed{7}\ verb\ \begin{bmatrix} \text{VFORM:} & \textit{s-part} \\ \text{MOD:} & \boxed{3} \end{bmatrix} \\ \text{SUBJ:} & \langle\rangle \\ \text{COMPS:} & \langle\rangle \end{bmatrix} \\ \text{CONTENT:} & \boxed{10}\ \begin{bmatrix} \text{INDEX:} & \boxed{8} \\ \text{RESTR:} & \{\begin{bmatrix} fly \\ \text{FLIER:} & \boxed{8} \\ \text{FLOWN:} & \boxed{5} \end{bmatrix}\} \cup \boxed{11} \end{bmatrix} \\ \text{INHER|RELAT:} & \begin{bmatrix} \text{SPC:} & \{\boxed{4}\} \\ \text{OPC:} & \{\boxed{2}\} \end{bmatrix} \end{bmatrix}$$
kullan-an
fly-SPc

5.1.3   Relativization in Embedded Phrases

The lexical rules we present in this section are responsible for relativization in embedded phrases such as possessive nominal compounds, relative clauses and nominalization phrases.[29] All the rules in this set have the following common features:

(i) They relativize an argument of the input lexical entry.

(ii) They leave the MOD and the CONTENT values of the input unchanged.

Possessor (Subject) Relativization in Noun Phrases

Recall from Section 3.2 that we treat possessors as subjects in HPSG. The lexical rule in (64) deals with relativization of possessors (subjects) in noun phrases. The rule simply removes the only element in the SUBJ list of the input from this list and places it within the INHER|RELATIVIZED|SPC value of the output. The constraint that the input must have *nominative* as its CASE value serves to prevent overgeneration since there are other lexical rules which operate on the outputs of this rule to affix different case suffixes, hence change the CASE value. (See, for example, the relative clause in (45) and its structure in (46), and the one in (55) and its structure in (57).)

$$(64) \quad \begin{bmatrix} \text{HEAD } \boxed{1} \ noun \ [\text{CASE } nom, \text{-PRD}] \\ \text{SUBJ } \langle \text{NP}[\text{LOC } \boxed{2}\,] \rangle \end{bmatrix} \implies \begin{bmatrix} \text{HEAD} & \boxed{1} \\ \text{SUBJ} & \langle\rangle \\ \text{INHER|RELATIVIZED|SPC } \{\boxed{2}\} \end{bmatrix}$$

Relativization in Relative Clauses: There are three rules in this category:[30]

The lexical rule in (65) deals with object relativization in relative clauses with *s-part* verbal heads. Note that an application of this rule to an output of the rule in (41) (i.e. object relativization when the subject is nominative), which has a nonempty SUBJ value, would result in two object gaps in the same clause, which is not possible in Turkish (cf. Section 4). Therefore, the SUBJ value of the input has been constrained to be empty to block such an application.[31] This constraint, furthermore, prevents (65) from applying to an output of the rule in (49) or the one in (54).[32] The constraint that the input must have an empty INHER|RELATIVIZED|OPC value serves to prevent (65) from applying to its own output, hence to block more than one object gap in the same relative clause. (See, for instance, the relative clause in (52) and its structure in (53), and the one in (62) and its structure in (63).)

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[29] There are in fact similar rules that deal with relativization in postpositional phrases and infinitive phrases as well, which we omit here because of space limitations.

[30] Here, we give only two of these rules. The third one deals with relativization of the objects of *o-part* verbs with a PP gap host. We do not concern ourselves with the details here, but it turns out that it is not possible to relativize an object of an *o-part* verb one of whose arguments is a gap host unless that argument is a PP.

[31] Note, however, that this constraint does not block the relativization of the second object in the case of *s-part* verbs that have been derived from *impersonal passives* since in this case the SUBJ value would be empty anyway. Note also that we haven't provided any account of relativization in impersonal passives in this paper. These issues remain to be worked on.

[32] We do not concern ourselves with the details here, but it seems to be impossible to relativize an object in a relative clause headed by an output of one of these lexical rules. Consider the *s-part* verb *gören* in (i) (an output of (54)) for an example:

(i)   a.   [__$_j$ __$_i$ Sev-diğ-i]   kadın$_i$ çocuğ-u   gör-en] adam$_j$ yürü-dü.
                  love-OPc-3sPoss woman child-ACC see-SPc man   walk-PAST

$$(65) \quad \begin{bmatrix} \text{HEAD} & \boxed{1}\,verb\begin{bmatrix}\text{VFORM } s - part\end{bmatrix} \\ \text{SUBJ} & \langle\,\rangle \\ \text{COMPS} & \langle ..., \text{NP[LOC } \boxed{2}\,], ...\rangle \\ \text{INHER|RELATIVIZED|OPC } \{\} \end{bmatrix} \implies \begin{bmatrix} \text{HEAD} & \boxed{1} \\ \text{COMPS} & \langle ...\rangle \\ \text{INHER|RELATIVIZED|OPC } \{\boxed{2}\} \end{bmatrix}$$

The second rule in this category is the one in (66), which is responsible for subject relativization in relative clauses with *o-part* verbal heads. The constraint that the subject of the input (which is to be relativized by the rule) must have empty INHER|RELATIVIZED|OPC value serves to prevent the rule from applying to an output of the rule in (59) (Section 5.1.2) since the subject of such an output (which is to function as the gap host in a relative clause headed by that output) can not be relativized. On the other hand, (66) can apply to an output of (44) (Section 5.1.2) producing an *o-part* verb such as *bildiği* in the structure for (69) (Section 5.2). (See, for example, the relative clause in (47) and its structure in (48), and the one in (56) and its structure in (58).)

$$(66) \quad \begin{bmatrix} \text{HEAD } \boxed{1}\,verb\begin{bmatrix}\text{VFORM } o - part\end{bmatrix} \\ \text{SUBJ } \langle \text{NP[LOC } \boxed{2}\,, \text{INHER|RELATIVIZED|OPC } \{\}]\rangle \end{bmatrix} \implies \begin{bmatrix} \text{HEAD} & \boxed{1} \\ \text{SUBJ} & \langle\,\rangle \\ \text{INHER|RELATIVIZED|SPC } \{\boxed{2}\} \end{bmatrix}$$

Note that there is no rule that relativizes the subject of an *s-part* verb which is an output of the rule in (49) (page 101) or the one in (54) (page 105). In the former case, the subject can not be relativized since it is a nominative (nonspecific) subject (cf. Section 4). In the latter case, the subject of such an output is to function as the gap host in a relative clause headed by that output, hence can not be relativized.

Relativization in Nominalization Phrases: There are two rules in this category:

The first one, which deals with subject relativization in nominalization phrases, is given in (67). The constraint that the input must have *nominative* case has a similar function to the constraint in the rule (64) (i.e. possessor relativization in noun phrases). Note that the case of the subject of the input is constrained to be *genitive* since nominative (nonspecific) subjects of non-finite Turkish sentences can not be relativized (cf. Section 4). (See the relative clause in (50) and its structure in (51) for an example.)

$$(67) \quad \begin{bmatrix} \text{HEAD } \boxed{1}\,verb\begin{bmatrix}\text{VFORM } nominalization\ [\text{CASE } nom]\end{bmatrix} \\ \text{SUBJ } \langle \text{NP[LOC } \boxed{2}\,, gen]\rangle \end{bmatrix} \implies \begin{bmatrix} \text{HEAD} & \boxed{1} \\ \text{SUBJ} & \langle\,\rangle \\ \text{INHER|RELATIVIZED|SPC } \{\boxed{2}\} \end{bmatrix}$$

Object relativization in nominalization phrases, on the other hand, is dealt with by the rule in (68). The constraint that the input entry must have empty INHER|RELATIVIZED|OPC value is to block more than one object gap in the same nominalization phrase (cf. Section 4). In

---

'The man who the woman he loved saw the child walked.'

b.   * [[__$_j$ __$_i$ sev-diğ-i]   kadın$_i$ __$_k$ gör-en] adam-ın$_j$ yürü-düğ-ü]   çocuk$_k$
          love-OPc-3sPoss woman   see-SPc man-GEN walk-OPc-3sPoss child

'the child such that the man who the woman he loved saw him (the child) walked'

other words, it prevents (68) from applying to its own output. (See, for instance, the relative clause in (60) and its structure in (61).)

$$(68) \quad \begin{bmatrix} \text{HEAD} & \boxed{1}\ verb \begin{bmatrix} \text{VFORM}\ nominalization\ [\text{CASE}\ nom] \end{bmatrix} \\ \text{COMPS} & \langle ..., \text{NP}[\text{LOC}\ \boxed{2}\ ], ... \rangle \\ \text{INHER}|\text{RELATIVIZED}|\text{OPC}\ \{\} \end{bmatrix} \implies$$

$$\begin{bmatrix} \text{HEAD} & \boxed{1} \\ \text{COMPS} & \langle ... \rangle \\ \text{INHER}|\text{RELATIVIZED}|\text{OPC}\ \{\boxed{2}\} \end{bmatrix}$$

5.2   A Complex Example

In this section, we consider a further example to illustrate how the analysis deals with a more complex case. The example, given in (69), contains three embedded relative clauses. The innermost one (headed by *okuduğu*) has a subject and an object gap, the middle one (headed by *bildiği*) has a subject gap and the outermost one (headed by *yürüyen*) has no gaps.

(69)   [[—$_k$ [—$_j$ —$_i$ oku-duğ-u]   kitab-ı$_i$ bil-diğ-i]   adam$_j$ yürü-yen] kadın$_k$
          read-OPc-3sPoss book-ACC know-OPc-3sPoss man   walk-SPc woman

    'the woman such that the man that she knows the book he reads walked'

The structure for this example is given below. The *o-part* verb *okuduğu* is the output of the consecutive applications of the lexical rules (38) and (66), exactly like the *o-part* verbal head of the embedded relative clause in (48) (page 100). The *o-part* verb *bildiği*, on the other hand, is the output of the consecutive applications of the following lexical rules:

  (i) The rule in (44) has applied to the lexical entry for the *base* verb *bil*, producing an output entry (an *o-part* verb) whose accusative object (the gap host) has been constrained to have a nonempty INHER|RELATIVIZED|OPC value.

 (ii) The output entry of the above application has then been input to the lexical rule in (66), which has relativized its subject placing it in the INHER|RELATIVIZED|SPC set of the final output (the one we see as the lexical entry of *bildiği* in the structure below).

Finally, the *s-part* verb *yürüyen* in the outermost clause is the output of the rule in (54), which has constrained its subject (the gap host) to have a nonempty INHER|RELATIVIZED|SPC value.

kadın
woman

yürü-yen
walk-SPc

adam
man

bil-diğ-i
know-OPc-3sPoss

kitab-ı
book-ACC

oku-duğ-u
read-OPc-3sPoss
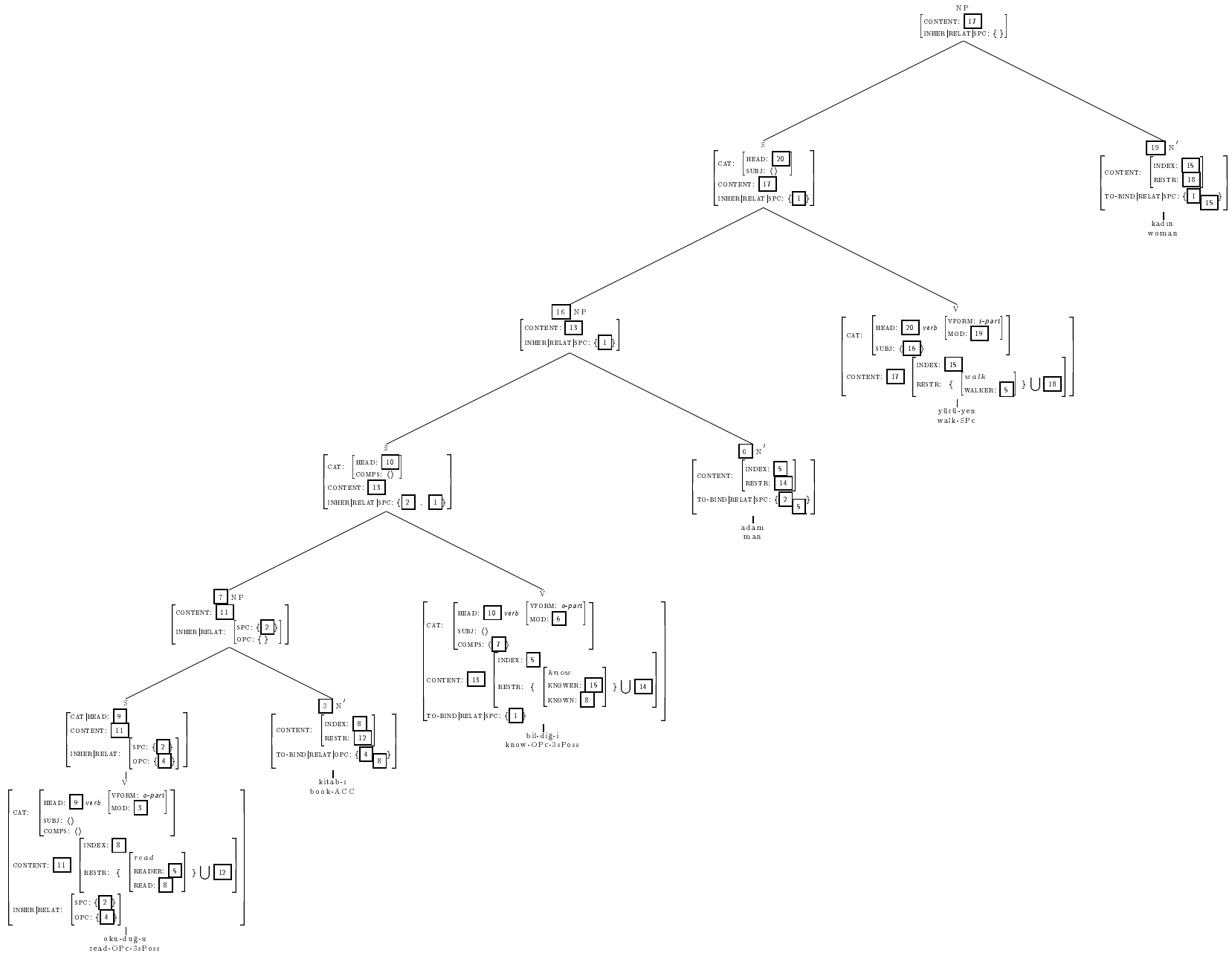
5.3   Constraints on Relativization

In Section 4 we discussed a number of constraints on relativization in Turkish, and in Sections 5-5.1 we referred to these constraints from time to time while presenting the HPSG analysis. The aim of this section is to make it easy for the reader to see how these constraints are handled in the analysis by summarizing the strategies used for this purpose. As the discussion below will reveal, the formalization of the constraints on relativization relies on a number of features: first the use of separate valence features SUBJ and COMPS (as introduced in Pollard and Sag (1994)[Chapter 9]); second the introduction of the new NONLOCAL feature RELATIVIZED to be used in the analysis of relativization in Turkish; and third the use of the separate RELATIVIZED features SPC and OPC to treat subject and non-subject gaps. The constraints are formalized either in the form of a language particular principle (i.e. Finite Sentence Relativized Constraint) or as constraints on the input lexical entries of the lexical rules for relativization presented in Sections 5.1.3-5.1.2.

Constraint on Non-subject Relativization

Recall from Section 4 that it is not possible to have two non-subject gaps in the same clause in Turkish. This constraint is related to the rules that deal with object relativization in embedded relative clauses and nominalization phrases. Therefore, the only cases we need to worry about are object relativization in *s-part* verbs (rule (65)) and *nominalization* verbs (rule (68)). We deal with this restriction by placing constraints on the input lexical entries of these two rules to prevent them from applying to their own outputs since this would result in more than one object gaps in the clause headed by an output produced by such an application. In addition, (65) requires its input to have an empty SUBJ list so that an output of (41) would not be an input to this rule resulting in two object gaps in a relative clause with a nominative subject.

Constraint on Relativization of Nominative Subjects of Non-finite Sentences

In Section 4, we saw that it is not possible to relativize the nominative (nonspecific) subjects of non-finite Turkish sentences. This constraint is related to the rules that deal with subject relativization in embedded relative clauses and nominalization phrases. Note that in the case of relative clauses, nominative subjects appear only in the outputs of the lexical rules in (41) and (49), which derive *s-part* verbs from *base* verbs, and that there is no rule to relativize the subject of an *s-part* verb in Section 5.1.3. Therefore, this case is trivially handled. In the case of nominalization phrases, on the other hand, the rule in (67) (which relativizes the subject of a *nominalization* verb) constrains the subject of the input entry to be *genitive* to get around this problem, as explained on page 113.

Constraint on Relativization across Finite Sentences

In Section 4, we considered some examples to show that in Turkish, no relativized constituent can cross the boundaries of a *finite* sentence. Recall that the language particular Finite Sentence Relativized Constraint, formalized in (34), deals with this restriction by requiring finite sentences to have empty values for the INHER|RELATIVIZED features.

6   Conclusions

Relativization in Turkish is interesting in that it is mainly controlled by an interaction between syntax, morphology and context. There are two strategies for relativization in Turkish, SPc and OPc, whose distribution has been the main concern of the accounts of Turkish relative clauses in the literature (e.g. Underhill (1972), Hankamer and Knecht (1976), Dede (1978), Csató (1985), and Barker *et al.* (1990)). These two strategies differ from each other in various respects such as the morphological endings on the verb and the subject of the clause, and the existence/nonexistence of an agreement requirement between the subject and the verb. The role of context in determining the relativization strategy is a result of the fact that genitive case-marking on subjects of nonfinite Turkish sentences functions as a marker of specificity, that is, subjects that have a specific interpretation in a given context are marked genitive while others are left unmarked. In the case of relative clauses, this choice further determines the participle suffix on the verb of the clause, hence the relativization strategy. Furthermore, relativization is also possible in embedded phrases of certain kinds such as possessive nominal compounds, postpositional phrases, relative clauses, nominalization phrases and non-subject infinitive phrases, resulting in long distance dependencies.

In the first part of this paper (Sections 2-3), we showed that the function of genitive case-marking as a marker of specificity is the only factor that determines the relativization strategy to use in a given clause in the case of bounded relativization and unbounded relativization when the gap host is a non-subject constituent: If there is a subject in the clause, then it is either genitive marked (specific) or left unmarked (nonspecific), depending on the context, and if there is a genitive subject in the clause then the OPc strategy is used, otherwise the SPc strategy is used. (Consequently, in the case of impersonal passives, where there is no subject at all, the only possible strategy is SPc (cf. Section 2.2).) However, in the case of unbounded relativization where the gap host is the subject, the function of genitive case-marking as a marker of specificity is overriden by the grammatical role of the gap: If the grammatical role of the gap is subject, then the subject of the relative clause (the gap host) is left unmarked and the SPc strategy is used. Otherwise, the subject of the clause is marked genitive and the OPc strategy is used. We formulated these facts in a descriptive pattern of relativization in Turkish given in (16) (Section 3.1).

In Section 4, we discussed certain constraints on relativization in Turkish. We, then, presented an HPSG analysis of relativization in Turkish in Section 5, using the descriptive pattern that we derived in Section 3.1, and also considering the constraints from Section 4. The analysis makes use of a new NONLOCAL feature RELATIVIZED that takes values of a new sort *relativized* with two appropriate features, SPC and OPC, both of which take values of sort *set(local)*. Using a separate NONLOCAL feature, RELATIVIZED, in the analysis of relative clauses lets the third constraint mentioned in Section 4 (i.e. the one on relativization across finite sentences) be readily formalized in the form of a language particular principle (i.e the Finite Sentence Relativized Constraint on page 89) and also lets subject and non-subject gaps be treated in different ways only in the case of relativization (since such a distinction is not required in the case of other UDCs). The main feature of the analysis is that it is based on a number of lexical rules that derive participles from *base* verbs or deal with relativization in embedded phrases. The first two constraints in Section 4 (i.e. the ones on non-subject relativization and relativization of nominative subjects of non-finite sentences) are handled by certain constraints

on the input entries of these lexical rules as summarized in Section 5.3.

A number of issues remain to be worked on. Firstly, as explained above, the analysis presented in this paper does not provide an account of relativization in impersonal passives. Secondly, it does not take into account the role of contextual factors in determining the relativization strategy mainly because of the lack of a complete analysis of the specificity of Turkish NPs Finally, the reasons for certain additional restrictions (cf. footnotes 30-32) require further investigation.

Acknowledgments

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4

Definiteness and the Make-up of Nominal Categories

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Abstract

Much research on the syntax of nominals assumes a mould designed on the basis of properties of the English noun phrase. This, for the most part, consists of a determiner and a noun projection. The Greek noun phrase, however, does not fit into such a mould but rather requires a quite different perspective. First, the various nominal categories (nouns, adjectives, numerals, determiners, etc. and their projections) are much less distinct than generally assumed. Secondly, definiteness and indefiniteness are expressed in ways that cannot be accommodated within an English-style determiner-centric system. The principal objective of this paper is to provide a syntax of nominal categories that complements English-style descriptions and account for definite concord phenomena, "determinerless" NPs, and elliptical nominals that lack a noun head. The account proposed is couched in the framework of Head-driven Phrase Structure Grammar (HPSG). HPSG's multidimensional architecture lends itself well to expressing the idiosyncratic syntactic behaviour and semantic import of "markers of definiteness" in definite constructions. Phenomena discussed here with respect to Greek are in fact characteristic of a wide range of languages e.g. Mainland Scandinavian, Balkan (cf. Börjars 1994) and Semitic (Hebrew, Arabic). One of the main areas for development of the current approach is extending it to the nominal system of such languages.

1   The Greek noun phrase: basic issues

1.1   Introduction

Much research on the syntax of noun phrases assumes a mould designed on the basis of properties of the English noun phrase. This, for the most part, consists of a determiner and a noun projection. Other languages, however, including Greek, do not fit into such a mould but rather require a quite different perspective. First, the various nominal categories (nouns, adjectives, determiners, numerals, etc.) are much less distinct than generally assumed. Secondly, definiteness and indefiniteness are expressed in ways that cannot be accommodated within an English-style determiner-centric system. In this paper, I develop an account of the syntax and semantics of the Greek noun phrase couched in the framework of Head-driven Phrase Structure Grammar (HPSG: Pollard and Sag 1994.[1] This account can be extended to cover similar phenomena and in particular definite concord in a wide range of languages e.g. Mainland Scandinavian (Swedish and Norwegian, cf. Börjars 1994), Balkan, and Semitic (Hebrew and Arabic).

In the introductory section, I present data from Modern Greek and discuss problems for previous approaches. In section 2, I provide a cross-classification of Greek nominal categories, in terms of *inheritance.* In section 3, I present an HPSG account for determiners and in addition *numerals* i.e. the cardinals or nominals such as poli (many), ligi (few), etc. This analysis accounts for both regular and elliptical examples. In section 4, I present an approach to definiteness that distinguishes the definite article in Greek from other determiners and enables a straightforward account of definite concord (or *polydefiniteness*) to be provided. In section 5, I demonstrate how an analysis of other nominal types such as Greek demonstratives can be integrated into the current account of definiteness. In section 6, I formulate the Uniqueness Principle and deal with a few technical issues. Conclusions and suggestions for

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[1] See Kolliakou (1995) for an extended version of this paper.

further reasearch are summarized in section 7.

1.2 Monadic definites and polydefinites: an empty head approach

Definite NPs in Modern Greek can be partitioned into two classes: *monadic definites* and *polydefinites*. The former are like English definites, in the sense that they have a single definite article, whereas the latter contain multiple definite articles. See (1) and (2), respectively.

(1)   to kokino podilato
       the red   bike
       'the red bike'

(2) a. to kenurio to kokino podilato
       the new   the red   bike
       'the new red bike'

     b. ta dio ta podilata ta kokina
       the two the bikes   the red
       'the two red bikes'

Most accounts do not distinguish the Greek definite article from other determiners at the syntactic level. Both determiners and the definite article are treated as specifiers (in accounts assuming an X-bar analysis of NPs on the line of Jackendoff (1977)) or as functional heads (in accounts assuming the DP hypothesis cf. Abney (1987)). However, such approaches cannot accommodate polydefinites. I argue that polydefinites are instances of definite concord. In particular, I focus on issues such as the following. What is the syntactic make-up of poly-definites? What is "definite concord"? What is the semantic contribution of the multiple definite articles involved?

The definite article in Greek polydefinites appears to cooccur with distinct categories: noun projections (**kokino podilato** 'red bike' in (2a)), adjectives (**kenurio** 'new' in (2a)), cardinals (**dio** 'two' in (2b)). An analogous situation arises in elliptical nominals. Consider the examples in (3).

(3) a. Mu eklepsan to palio podilato ki agorasa   kenurio.
       me stole-3.PL the old bike   and bought-1.SG new
       'My old bike was stolen and I bought a new one.'

     b. Ta vivlia ihan ekptosi. Agorasa   merika.
       the books were on sale. bought-1.SG some
       'The books were on sale. I bought some.'

     c. Ehi   dio podilata. Mu danise   to kokino.
       has-3.SG two bikes.   me lent-3.SG the red
       '(S)he has two bikes. (S)he lent me the red one'

The verb **agorasa** (bought-1.SG) in (3a&b) appears to co-occur with an adjective **kenurio** (new) and a determiner **merika** (some), respectively. Nevertheless, constituents that have the same basic distribution pertain to the same syntactic category. Both polydefinites and elliptical constructions raise the following questions. Why is it that apparently distinct categories have the same distribution? What is the syntactic make-up of the various nominal categories?

It has been suggested (e.g. Horrocks and Stavrou 1986, Stavrou and Horrocks 1990 & Stavrou 1991) that polydefinite and elliptical nominals can be accounted for by positing phonologically empty noun categories. Stavrou and Horrocks analyse both sequences consisting of a definite article and an AP in polydefinites (e.g. **to kokino** (the red)) and elliptical nominals as DPs that have an empty noun ($\emptyset$). This is illustrated in (4).

(4)

$$
\begin{array}{c}
\text{DP} \\
\diagup\,\diagdown \\
D^0 \qquad \text{NP} \\
|\qquad\quad \diagup\,\diagdown \\
\text{to}\quad \text{AP}\quad \text{N}' \\
\;\;\;\;\;\;|\qquad | \\
\;\;\;\;\;\;\text{kokino}\;\; N^0 \\
\;\;\;\;\;\;\;\;\;\;\;\; | \\
\;\;\;\;\;\;\;\;\;\;\;\; \emptyset
\end{array}
$$
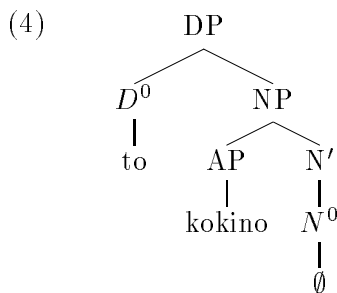
Beyond the fact that independent motivation for positing empty heads is lacking (for discussion, see Sag and Fodor (1994)), the null head approach runs into significant empirical problems. For instance, postulation of empty heads in Stavrou and Horrocks's grammar is not sufficiently restrictive. Therefore, this grammar does generate ill-formed examples such as (5) below, with an empty head preceded by more than a single adjective.

(5)   *to podilato to kenurio kokino $\emptyset$
       the bike   the new   red $\emptyset$

Similarly, Stavrou and Horrocks's system cannot account for the variant distribution of different types of determiner in empty noun nominals. Their grammar fails to capture the distinction between the definite article and other determiners in Greek, therefore, it allows for both (6a) and the ungrammatical (6b).[2]

(6) a. Pulusan   vivlia. Agorasa   merika
       were-selling-3.PL books. bought-1.SG some $\emptyset$
       'They were selling books. I bought some.'

    b. *Pulusan   vivlia. Agorasa   to
       were-selling-3.PL books. bought-1.SG the $\emptyset$

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[2] Previous approaches to Modern Greek NPs and "polydefiniteness" that assume the framework of Principles and Parameters and posit empty categories or treat the definite article as a *functional head* are discussed in detail in Kolliakou (1995), chapter 2.

The distribution of distinct types of determiner is accounted for in Nerbonne et al.'s work on nominal ellipsis in Germanic (cf. Nerbonne *et al.* 1989 & Nerbonne 1994). Nerbonne et al. identify three determiner classes: *dependent, independent* and *indiscriminate* ones. Dependent determiners, e.g. my, a/an, no in English, never appear in NPs lacking a noun head, cf. this is my book vs *this is my). On the other hand, independent determiners, e.g. mine or none always occur on their own (e.g. this is mine), whereas indiscriminate determiners e.g. several are admitted in both regular and elliptical nominals (cf. I bought several books vs Books were on sale. I bought several). To distinguish between regular and elliptical $\bar{N}$'s, Nerbonne et al. postulate empty nouns and they employ EDGE FEATURES (in the sense of LaPointe (1990) & Miller (1992)). Independent or indiscriminate determiners that freely occur in elliptical environments are taken to select for $\bar{N}$'s with an empty left periphery, specified LEFT PERIPHERY EMPTY (LPE)+ (where LPE is an EDGE FEATURE). On the other hand, dependent forms are taken to select for LPE− $\bar{N}$'s that have a lexical noun head.

However, unlike English, Greek provides very little evidence that determiners can be partitioned into dependent, independent and indiscriminate ones: with the exception of the definite article, Greek determiners are "indiscriminate" and may occur in construction with a noun projection in canonical examples, or on their own, in elliptical examples. The idiosyncratic distribution of the Greek definite article—unlike determiners, it never occurs on its own, as was shown in (6b) above—can be taken to indicate that it is not a determiner and should rather be distinguished from other determiners. This line is taken in the current work that argues for an analysis of the Greek definite article as a "marker of definiteness".

2   An inheritance-based approach to nominal categories

2.1   Inheritance and sort hierarchies

In this work, generalizations about the various nominal categories are captured in terms of inheritance, cf. Flickinger (1987), Flickinger and Nerbonne (1992), Carpenter (1992) and others. Nominal categories that have the same distribution are taken to be subsumed under the same supercategory (sort). Consider for example Greek nouns, adjectives, and in addition cardinals and elements such as pola (many), liga (few) or diafora (various).[3] In traditional accounts such elements are taken to pertain to distinct syntactic categories. However, they qualify as complements of the same types of head: (a) verbs or prepositions (nominal-taking heads) (b) determiners and (c) the definite article. Examples are provided in (7). The verb complement in (7a) can be a noun, adjective or numeral category. The determiner opiadipote (whichever/any) in (7b) may cooccur with nouns, adjectives or numerals. The same applies to the definite article to (the-SG.NEUT) in (7c).

(7) a. agorasa   vivlia/ kenurio/ tria
       bought-1.SG books/ new/   three
       'I bought books/a new one/three'

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[3] Henceforth, cardinals and elements that pattern alike are referred to as *numerals*. Motivation for distinguishing these elements from determiners is provided in Section 3.3.

  b. opiadipote vivlia/ kenuria/ tria
     whichever books/ new/   three
     'any books'/'any new ones'/'any three'

  c. ta   vivlia/ kenuria/ tria
     def books/ new/   three
     'the books'/'the new ones'/'the three'

The commonalities of nouns, adjectives, numerals and their projections in Modern Greek can be straightforwardly accounted for if these categories are taken to be partly unified. More specifically, those three categories can be construed as disjoint subsorts of a sort *noun-adj-num (noun-adjective-numeral)* from which they inherit their common properties. At the same time, they will be subsumed under distinct supersorts in order that they obtain their idiosyncratic properties. Categories that invariably cooccur with noun, adjective or numeral projections (e.g. nominal-taking heads, determiners and the definite article) select for the supercategory *noun-adjective-numeral.* Therefore, lexical disjunction is eliminated from lexical representation. The sort *noun-adj-num* and its subsorts is given in (8).

(8)   *noun-adj-num*

          noun   adjective   numeral
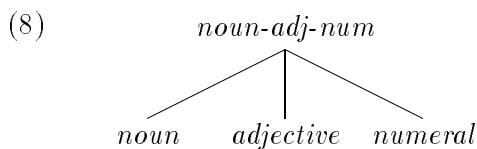
Inheritance is a powerful mechanism that enables the HPSG lexicon to be *structural* or *hierarchical.* Any property that is not idiosyncratic to a particular lexical item, rather it is shared between distinct items, will be represented only once in this type of lexicon, as a single sort, with all lexical items that share this property being members (subsorts) of that sort. For a fully specified lexical entry to obtain all of its properties, it will have to be associated with many sorts. The hierarchical lexicon is a set of sort hierarchies, interconnected through inheritance. This approach to representation of lexical information enables redundancy to be eliminated. Inheritance is defined as follows.

A feature declaration of the form:

$$(9) \qquad \sigma : \begin{bmatrix} F_1 \ \tau_1 \\ F_n \ \tau_n \end{bmatrix}$$

where σ, τ_1, ..., τ_n are sorts and F_1, ..., F_n are feature labels, signifies that for each $\iota = 1$, ..., n, (a), the feature F_ι is appropriate for all subsorts of sort σ and (b), for any subsort of sort σ, the value of F_ι must be an object of sort τ_ι. If sorts σ_1 and σ_2 bear declarations [F τ_1] and [F τ_2], respectively, for the same feature F, and σ_2 is a subsort of σ_1, then τ_2 is a subsort of τ_1.

HPSG sorts are either feature structures or atomic. The latter are maximally specific sorts for which no features are defined. A sort inherits the feature declarations of its supersorts: hence, any feature which is defined for a given sort, is defined for all of its subsorts.

2.2 A hierarchy of nominal sorts for Greek

I proceed with presenting a cross-classification of Greek nominal categories in terms of inheritance. In particular, I define the sort *nominal* that subsumes categories such as the definite article, determiners, nouns, adjectives, numerals, etc. This sort is essentially a cluster of morphosyntactic properties that pertain to all nominal classes in Greek. Technically, it is a feature declaration inherited by all of its subtypes in the hierarchy. A feature structure of sort *nominal* serves as a value of the feature HEAD. The sort *nominal* is a subsort of *head* that in turn subsumes all the syntactic classes, e.g. *nominal*, *verbal*, etc. The value of HEAD is an object of sort *head*, or in other words, any subsort of *head* can serve as a value of HEAD. The lattice in (10) shows *nominal* and its subsorts.

(10)   *nominal*

```
          nominal
         /       \
      def     det − nondet
               /        \
            det    noun − adj − num
                   /      |      \
                noun    adj    num
```
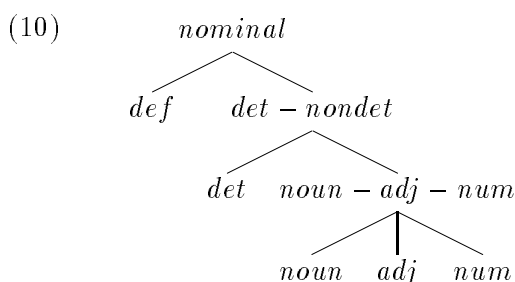
The sort *nominal* partitions into the sorts *def (definite-article)* and *det-nondet (determiner-nondeterminer)*. This signifies that the Greek definite article is distinguished from determiners (or in fact other nominal categories) and constitutes a category on its own (*def*). Motivation for separating the definite article from the determiner class comes from the polydefinite construction (for detail, see Section 3 and Section 4). The sort *det-nondet* subsumes both determiners and other nominal categories that have a different distribution than determiners. It partitions into *det (determiner)*, that subsumes determiners and their projections, and *noun-adj-num* that subsumes the sorts *noun, adjective* and *numeral*. The partition of *nominal* and its subsorts relies on the syntactic behaviour of Greek nominal categories. For example, *det-nondet* accommodates categories that qualify as complements of nominal-taking heads (e.g. verbs and prepositions). These are determiners, nouns, adjectives, numerals and their projections. The verb **agorasa** (bought-1.SG) takes a noun complement in (11a), it combines with a determiner or a numeral in the second conjunct of (11b) and with an adjective in (11c).

(11) a. agorasa   biblia
        bought-1.SG books
        'I bought books.'

    b. Pulusan   aglika   vivlia. Agorasa   merika / tria.
        were-selling-3.PL English books. bought-1.SG some   / three
        'English books were on sale. I bought some / three.'

    c. Ehasa   to vivlio mu ki agorasa   kenurio.
        lost-1.SG the book my and bought-1.SG new
        'I lost my book and bought a new one.'

The definite article is not a member of *det-nondet*, therefore, nominal-taking verbs never cooccur with it. E.g.:

(12)   *agorasa   to
         bought-1.SG *def*

The sort *nominal* and its subsorts are sort values of the feature HEAD. By the Head Feature Principle (HFP) of HPSG, they are made available on the maximal projection of a lexical category (word). As will be shown in detail in Section 4, in the current system definite phrases are not analysed as projections of the definite article, rather their syntactic category is determined by the nominal the definite article is combined with (a noun, adjective or numeral category). For instance, the definite NP in (13a) below and the elliptical ta aglika (the English ones) in (13b) are syntactically analysed as an NP and an AP, respectively. Both types of category are subsorts of *det-nondet*, therefore, their distribution in (13) is naturally accounted for.

(13) a. agorasa   ta   biblia
        bought-1.SG the books
        'I bought the books.'

     b. Pulusan   vivlia. Agorasa   ta   aglika.
        were-selling-3.PL books. bought-1.SG the English
        'Books were on sale. I bought the English ones.'

Let us consider next *noun-adj-num*. It subsumes categories that both the definite article and determiners may combine with. In (14) below, the definite article to (the-SG.NEUT) and the determiners kamposa (several) and opiadipote (any) cooccur with a noun (vivlia (books)), an adjective (aglika (English)) and a numeral phrase (NumP) tria lastiha (three tyres).[4]

(14) a. Agorasa   ta /   kambosa vivlia
        bought-1.SG the / several   books
        'I bought the / several books'

     b. Pulusan   vivlia. Agorasa   ta /   kamposa aglika.
        were-selling-3.PL books. bought-1.SG the / several   English
        'Books were on sale. I bought the / several English ones.'

     c. ta /   opiadipote tria lastiha
        the / any three   tyres
        'the / any three tyres'

The partitions of *nominal* and its subsorts are repeated for ease of reference in (15):

(15) a. Partition of *nominal*: *def, det-nondet*

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[4] A detailed account of determiners and numerals is provided in Section 3.

b. Partition of *det-nondet*: *det, noun-adj-num*

c. Partition of *noun-adj-num*: *noun, adj, num*

I discuss next the features and sort values that *nominal* and its various subsorts consist of. The feature declaration of *nominal* is as follows:

$$(16) \quad nominal : \begin{bmatrix} CASE\ case \\ FUN\ boolean \\ MOD\ synsem\ \lor null \end{bmatrix}$$

The features CASE, FUN and MOD are defined for all the subsorts of *nominal*. In addition, for any subsort of *nominal*, the values of CASE, FUN and MOD are objects of sort *case*, *boolean* and *synsem*, respectively. I will examine these features in turn.

In this system, the feature CASE denotes the morphological case of a nominal. All the nominal categories that are subsumed under *nominal*, i.e. the definite article, determiners, nouns, adjectives and numerals are morphologically marked for case. The value of CASE is an object of sort *case*. The partition of *case* is as follows:

(17)   Partition of *case*: *nom* (nominative), *acc* (accusative), *gen* (genitive)

The sorts *nom*, *acc* and *gen* are atomic subsorts, i.e., they are maximally specific.

The feature FUN (functional) will enable us to distinguish between substantive (or the so-called 'lexical') and functional nominals. The value of FUN is an object of sort *boolean*, where *boolean* partitions into two atomic sorts, *plus* (+) and *minus* (−):

(18)   Partition of *boolean*: *plus* (+), *minus* (−)

Substantive nominals (nouns, adjectives) are FUN−, whereas functional nominals (the definite article, determiners, numerals) are FUN+. The feature FUN plays a crucial role in the account of numerals. (See Section 3.3.)

Finally, MOD (modified) is a feature that plays an important role in the account of adjuncts (cf. Pollard and Sag 1994). The value of this feature is disjunctively defined: If MOD is borne by a modifier, its value is an object of sort *synsem*—a feature structure that describes the syntactic and semantic information borne by a word or phrase. The *synsem* value of a modifier's MOD is required to "match" with that of the modifiee's. This is how modifiers select for their syntactic sister in HPSG. Alternatively, if MOD is borne by an element that cannot function as a modifier, its value is *null*. In the nominal system described here, MOD is inherited by all subsorts of *nominal*, which means that all nominal classes in Greek may have members that function as modifiers. Since the definite article is subsumed under *nominal*, it carries the attribute MOD, too. In fact, MOD also plays a role in the account of the Greek definite article provided in this work.

Let us now turn to the sort *det-nondet*. This is a subsort of *nominal*, hence, it inherits CASE, FUN, MOD and their sort values. In addition, *det-nondet* is defined for the feature PRD (predicative):

(19) $det - nondet : \left[\; PRD \; boolean \; \right]$

Since PRD is defined for *det-nondet*, PRD will be defined for all the subsorts of *det-nondet* and, for any of these sorts, the value of PRD will be an object of sort *boolean*, i.e. *plus* (+) or *minus*(−). The binary-valued feature PRD cf. Pollard and Sag (1987) reflects the predicative/nonpredicative distinction. Predicative words or phrases (e.g. elements that may be complements to the copula) are PRD+ and vice versa. In the current work, PRD enables us to distinguish the sort *def* (the definite article) from the sort *det-nondet* that subsumes other nominal categories. Definite articles inherit the feature declaration of *nominal*, i.e. the features CASE, FUN and MOD. On the other hand, the other nominal categories identified here inherit the feature declaration of *det-nondet*, i.e., the features CASE, FUN, MOD and in addition PRD. The predicative/nonpredicative distinction is not relevant to the definite article. On the other hand, definite NPs, APs and NumPs can be predicative or not. They are assigned a PRD specification since they are subsorts of *det-nondet*.

Finally, consider the sort *noun-adj-num*. It is a subsort of *det-nondet*, hence, it inherits CASE, FUN, MOD and PRD. In addition, it is specified for the boolean feature N:

(20) $noun - adj - num : \left[\; N \; boolean \; \right]$

Subsorts of *noun-adj-num* convey the features CASE, FUN, MOD, PRD, and N, and for any such subsort, the value of N is a subsort of sort *boolean*, i.e. *plus* or *minus*. I employ the "abstract" feature N in order to distinguish between adjectives and nouns: the sort *noun* is specified N+, whereas the sort *adjective* is specified N−. Feature N cannot be seen to model a specific property, since it is not clear what properties distinguish nouns from adjectives.[5]

With the exception of N, all the features that we have employed in the current system and their sort values have a concrete correlate: all Greek nominals carry morphological case and may occassionally serve as modifiers. Thus, they are specified so, in terms of CASE and MOD. Moreover, nominal categories may be distinguished into functional ones and nonfunctional ones: the former do not iterate, occur in the left periphery of the phrase, and are members of closed classes (the determiners, numerals and the definite article), while the latter are members of open classes (nouns and adjectives). Hence, all nominal categories carry a [FUN+], or [FUN−] specification, respectively. In addition, certain nominal types can have a predicative use. For example, DPs, and definite or indefinite NPs, APs and NumPs (Numeral Phrases) may occur in construction with a copula. Therefore, these categories bear the feature PRD, and they are specified PRD+ in environments where they are employed predicatively, and PRD− otherwise. The properties expressed in terms of CASE, FUN, MOD, PRD and their sort values uniquely characterize nominal categories in Greek, and enable us to distinguish them from other categories, e.g. verbal categories, prepositions, adverbials, etc.

In this section, I have presented an analysis of Greek nominal categories and their characteristic properties in terms of feature structures that are bequeathed down to lexical entries which populate the lowest edges of the hierarchical lexicon. This analysis enables generalizations about the distribution of apparently distinct nominal types to be expressed and

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[5] In the English grammar presented in Pollard and Sag (1994), nouns and adjectives are distinguished by the feature CASE. CASE is defined for nouns but not for adjectives. However, this line cannot be adopted for Greek where both nouns and adjectives carry morphological case.

straightforwardly be accounted for. We see this in the next section, where I consider in particular canonical and elliptical nominals with a determiner or a numeral head.

3   An account of determiners and numerals

I proceed with providing an HPSG analysis of determiners and the elements I call *numerals*. In particular, in Section 3.1, I consider the notion of *functional completeness* cf. Netter (1994) and demonstrate that it is not relevant for the Greek nominal system. In Section 3.2, I present an analysis of determiners as heads that accounts for both regular and elliptical examples. Finally, in Section 3.3, I motivate the sort *numeral* and provide a syntactic and semantic account in HPSG.

3.1   Netter's functional completeness

An influential HPSG approach to determiners is presented in Netter (1994). Netter is concerned with a long-standing issue in the literature on noun phrases: which constituent is the syntactic head of a nominal—the determiner or the noun. In his system, both sorts of element play a role in determining the syntactic category of maximal nominal projections. In particular, Netter construes determiners and nouns as partly unified categories: they are both specified [N+, V−]. Thus, maximal nominal projections are also [N+, V−]. However, determiners and nouns, hence, their projections, differ from each other in terms of *functional completeness*. The notion of functional completeness expresses the idea that a category must not combine with a functional head (a determiner), but rather is a maximal projection as it stands. Technically, functional completeness is expressed in terms of a boolean head feature FCOMP. Determiners are FCOMP+, whereas nouns are FCOMP−. In Netter's account, determiners are treated as heads of DPs and they subcategorize for an NP complement. Therefore, the difference between DPs and NPs is that the former are functionally complete or maximal, whereas the latter must combine with a determiner in order to be maximal nominal categories. The feature instantiations on determiners, their NP complement and the DP mother is illustrated in (21).

(21)

$$\text{DP:} \begin{bmatrix} HEAD\ \boxed{1} \\ \\ SUBCAT\ <\ > \end{bmatrix}$$

head-daughter   complement-daughter
the   **book**

$$\begin{bmatrix} HEAD\ \boxed{1}\ \begin{bmatrix} N+ \\ V- \\ FCOMP+ \end{bmatrix} \\ \\ SUBCAT\ <\ \boxed{2}\ > \end{bmatrix} \qquad \boxed{2}\ synsem \begin{bmatrix} CAT\ |\ HEAD\ \begin{bmatrix} N+ \\ V- \\ FCOMP- \end{bmatrix} \end{bmatrix}$$
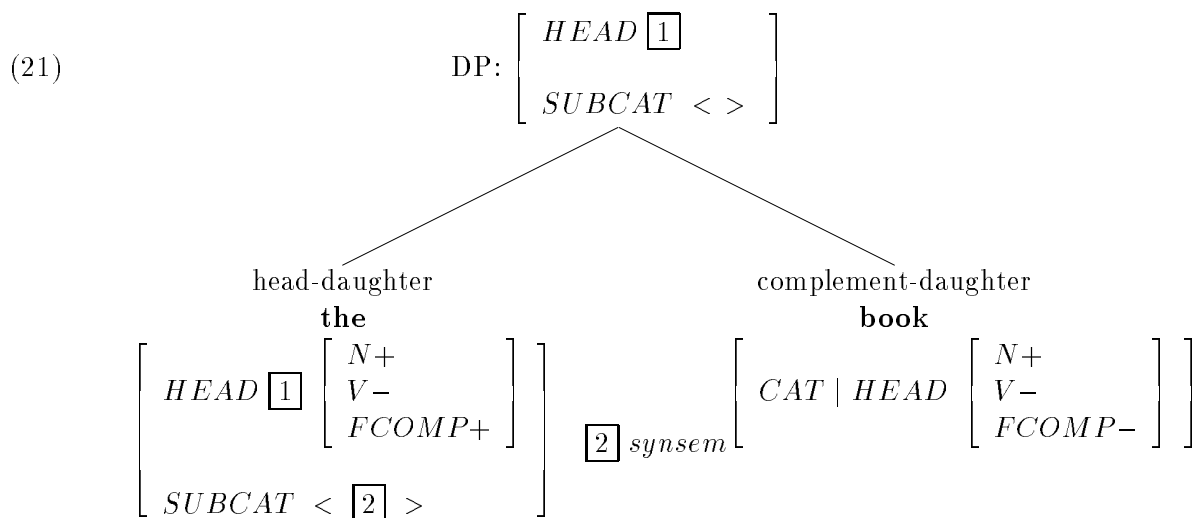
	Det/DP	FCOMPL+	N+	V−
N/NP (sing-count)		FCOMPL−	N+	V−
N/NP (mass term/plural)		FCOMPL+−	N+	V−

Table 1: Nominal categories in Netter's system

Functional completeness does not always originate from the determiner. In English there is a subset of "determinerless" nominals that are functionally complete, in the sense of Netter. These are bare plurals and mass terms that can either appear on their own or in construction with a determiner:

(22) a. 'I bought red wine'

b. 'I bought English books'

Mass nouns such as **wine** and plural forms such as **books** are underspecified in Netter's grammar. This signifies that they have two instantiations: a functionally complete (FCOMP+) one and a functionally incomplete (FCOMP−) one. Therefore, their distribution is accounted for. Table 1 above illustrates the feature composition of nominal categories in Netter's system.[6]

However, Netter's proposal cannot be maintained for languages like Greek. From an empirical point of view, Greek does not provide evidence that determiners "promote" NPs into maximal nominal categories. Rather, there is no class of nominals in the Greek nominal system that are required to combine with a determiner in order to function as maximal projections. Unlike English, in Greek not only mass terms and bare plurals but in addition singular count terms such as **podilato** (bike) may be determinerless. This is illustrated in (23) below: in (23a), the nominals **to podilato** (the bike), **podilata** (bikes) and **krasi** (wine) correspond to the three types of maximal nominal categories in English—determinerful NPs, bare plurals and mass terms. On the other hand, in (23b) the object of the verb **agorasa** (bought-1.SG) is the determinerless singular count term **podilato**. Such nominals have an "indefinite" interpretation: **podilato** in (23b) is equivalent to **ena podilato** (a bike).[7]

(23) a. agorasa   to podilato/ podilata/ krasi
        bought-1.SG the bike/   bikes/   wine
        'I bought the bike / bikes / wine.'

   b. agorasa   podilato ke to evala   sto domatio mu
        bought-1.SG bike   and it put-1.SG in-the room my
        'I bought a bike and put it in my room.'

Not only nouns but in addition other nominal categories in Greek can be determinerless, for instance, the adjective **kenurio** in the elliptical environment of (24) below.

---

[6] Netter's approach is discussed in more detail in Kolliakou (1995).

[7] Notice that podilato in (23) is a referential nominal: the clitic pronoun to (it) in the second conjunct refers back to it. That is, podilato is a syntactic argument of the verb agorasa (bought-1.SG), rather than being part of a hypothetical compound verb "bike-buy".

(24)   mu eklepsan   to podilato ki agorasa   kenurio
       from-me stole-3.PL the bike   and bought-1.SG new
       'My bike was stolen and I bought a new one'

In the next section, I proceed with an analysis of determiners for Greek that relies on the cross-classification of nominal categories in terms of inheritance presented in Section 2. This analysis does not make use of Netter's notion of functional completeness since Greek provides no evidence that there is a correlation between determiners and maximal nominal categories.

3.2   An HPSG analysis of determiners as heads

In this paper, I argue that determiners in Modern Greek should be treated as heads that subcategorize for a nominal complement (see below). Evidence for maintaining a head analysis of determiners, rather than treating them as subcategorized complements of nouns (see e.g. Pollard and Sag's (1994) account of English determiners[8]), comes from elliptical examples:

(25)   Pulusan   vivlia. Agorasa   merika
       were-selling-3.PL books. bought-1.SG some
       'Books were on sale. I bought some.'

If we treat determiners as complements of nouns, it is nontrivial to account for nominals such as **merika** in (25). In order that such elliptical nominals are accounted for, Nerbonne et al. (cf. Nerbonne *et al.* 1989, Nerbonne 1994) posit a phonologically null noun that subcategorizes for an appropriate type of determiner (see Section 1 above). However, there are good processing reasons to eschew empty categories: parsers are inevitably slowed by the need to postulate empty elements. In addition, Sag and Fodor (1994) review and find wanting both linguistic and psycholinguistic work purporting to justify the postulation of empty NPs. On the other hand, if determiners are taken to be heads that optionally subcategorize for a nominal category of a certain sort, then examples such as (25) above can be straightforwardly derived.

More specifically, Greek determiners are here taken to subcategorize for an element with head value of sort *noun-adj-num*. As shown in Section 2, *noun-adj-num* partitions into the sorts *noun*, *adjective* and *numeral*, i.e. it subsumes noun, adjective and numeral projections. Therefore, we account for examples such as those in (26) below, where the determiner **merika** (some) is combined with a noun and adjective category in (26a) and (26b), respectively, while the determiner **opiadipote** (any) in (26c) is combined with a numeral phrase.[9] The cross-classification of nominal sorts in terms of inheritance enables us to provide a syntax of the so-called elliptical nominals, without positing empty heads or lexical disjunction.

(26) a. Agorasa   merika vivlia.
        bought-1.SG some   books
        'I bought some books.'

---

[8]Pollard and Sag's account of determiners in English is discussed in detail in Kolliakou (1995).

[9]Determiners such as **merika** are not compatible with numerals or NumPs. This can be straightforwardly modelled in the current system: **merika** subcategorizes for an element with a head value of sort *noun-adj-num* that is also FUN−. As will be shown in Section 3.3, numerals are the only elements of sort *noun-adj-num* that are FUN+.

b. Pulusan   vivlia. Agorasa   merika aglika.
   were-selling-3.PL books. bought-1.SG some   English
   'Books were on sale. I bought some English one.'

c. Agorase   opiadipote tria   vivlia thelis.
   buy-2.SG.IMP any   three books want-2.SG
   'Buy any three books that you like.'

The AVM in (27) schematically illustrates the CATEGORY and CONTENT attributes of the Greek determiner **merika** (some-PL.NEUT). The tag $\boxed{2}$ inside the subcat list stands for the feature structure in (28) below.

$$
(27) \quad
\begin{bmatrix}
CAT &
\begin{bmatrix}
HEAD\ det &
\begin{bmatrix}
CASE\ \boxed{1}\ acc \\
FUN+
\end{bmatrix} \\
SUBCAT\ <\ \boxed{2}\ >
\end{bmatrix} \\
CONT \mid INDEX\ \boxed{3}
\begin{bmatrix}
NUM\ pl \\
GEND\ neut
\end{bmatrix}
\end{bmatrix}
$$

$$
(28) \quad \boxed{2}
\begin{bmatrix}
CAT \mid HEAD\ noun-adj-num \begin{bmatrix} CASE\ \boxed{1} \end{bmatrix} \\
CONT \mid INDEX\ \boxed{3}
\end{bmatrix}
$$

We have seen that the sorts *det* and *noun-adj-num* are subsumed under *nominal*, therefore, the feature CASE is defined for both determiners and noun, adjective or numeral projections. The lexicalist approach to determiners proposed here enables us to account for case concord between the determiner and its nominal complement, in terms of structure-sharing. Similarly, for number and gender agreement. It is specified inside the determiner's subcat list that the CASE and INDEX values of the determiner's subcategorized complement should be token-identical to its own. (See tag $\boxed{1}$ and tag $\boxed{3}$ in (27) and (28), for CASE and INDEX, respectively).

Phrases consisting of a determiner and a noun, adjective, or numeral category are licensed by the Immediate Dominance (ID) Schema 3 (cf. Pollard and Sag 1994):

(29)   *Schema 3.* The SYNSEM | LOCAL | CATEGORY | SUBCAT value is ⟨ ⟩ and the DAUGHTERS value is an object of sort *head-comp-struc*, whose HEAD-DAUGHTER value is a word.

The determiner's head value of sort *det* is propagated onto the mother by the Head Feature Principle (HFP).[10] In addition, once the determiner's subcategorization requirement is

---

[10] *The Head Feature Principle:* In a headed phrase, the values of SYNSEM | LOCAL | CATEGORY | HEAD and DAUGHTERS | HEAD-DAUGHTER | SYNSEM | LOCAL | CATEGORY | HEAD are token-identical.

satisfied, the SUBCAT value on the DP mother is the empty list, by the Subcategorization Principle.[11] This is schematically illustrated in the following tree-diagram:

(30)

$$\begin{bmatrix} HEAD\ det \\ \\ SUBCAT\ <\ > \end{bmatrix}$$

head   comp

$$\begin{bmatrix} HEAD\ det \\ SUBCAT\ <\ \boxed{1}\ > \end{bmatrix}\qquad \boxed{1}$$
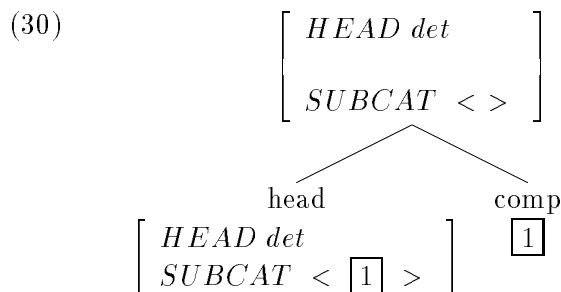
In the nominal system described here, both DPs and NPs are maximal nominal categories that qualify as arguments of nominal-taking heads (e.g. verbs and prepositions). Determinerful nominals are analysed as DPs. On the other hand, determinerless nominals are analysed as NPs, APs, NumPs, etc. However, no conflict arises since determiners, nouns, adjectives or numerals, hence, their projections, are subsorts of the same sort *det-nondet*, in other words, they are partly unified. Cross-classifying nominal categories in terms of inheritance enables us to get round a long-standing debate in the literature on NPs: should maximal nominal projections be analysed as NPs (noun projections) or DPs (determiner projections). In addition, the current approach provides a more precise characterization of elliptical nominals without positing linguistic constructs that are lacking independent motivation, such as empty heads.

A further important point is that in the current system there is no need to postulate a notion of $\bar{N}$ (intermediate noun projection) in order to distinguish nominals that can be modified by attributive adjectives from nominals that are maximal categories and thus cannot be modified any further. As will be shown in more detail below, attributive adjectives select and modify noun categories. Technically, these are words or phrases with a head value of sort *noun*. On the other hand, determinerful nominals, being construed as DPs, do not qualify as sisters of adjectives. Notice that modification is a problem for both Netter (1994) and the analysis of determiners presented in Pollard and Sag (1994). In particular, in these accounts it is nontrivial to distinguish between noun projections that can be modified by an attributive adjective (i.e., nonmaximal noun projections (**book**), determinerless mass terms (**wine**) and bare plurals (**books**)) from maximal noun projections that cannot be modified any further (i.e., determinerful nominals (**the book**)). In both systems, determinerless mass terms and plurals are indistinguishable from maximal noun projections. Therefore, well-formed examples such as **red wine** or **English books** are not accounted for. Rather, **wine** and **books** are clustered together with determinerful NPs such as **the book** that cannot be modified.[12] In contrast,

---

[11] *The Subcategorization Principle:* In a headed phrase, the list value of DAUGHTERS | HEAD-DAUGHTER | SYNSEM | LOCAL | CATEGORY | SUBCAT is the concatenation of the list value of SYNSEM | LOCAL | CATEGORY | SUBCAT with the list consisting of the SYNSEM values (in order) of the elements of the list value of DAUGHTERS | COMPLEMENT-DAUGHTERS

[12] In Netter's system, a solution for this problem is provided in terms of a boolean feature SPEC that denotes whether a nominal category includes a specifier or not. Adjectives select for SPEC− categories that do not contain a determiner, rather than SPEC+ nominals. However, this solution implies a certain amount of redundancy: Netter also employs the feature FCOMP (see above) that serves a very similar purpose: it denotes whether a nominal is functionally complete or not.

in the analysis proposed here, an attributive adjective such as kokino (red) can modify noun categories such as vivlio (book), krasi (wine) or vivlia (books), yielding thus kokino vivlio (red book), kokino krasi (red wine) and kokina vivlia (red books), respectively. However, kokino will not syntactically combine with DPs such as kapio vivlio (some book) and give rise to the ill-formed *kokino kapio vivlio (red some book).[13]

3.3 Numerals: a syntactic and semantic account for HPSG

In this paper, I argue that the cardinals and elements such as ligi (few), poli (many), diafori (several), etc. form the distinct class of numerals. As illustrated e.g. in Jackendoff (1977) for English, not any combination of specifiers (determiners) is well-formed. For instance, those several issues is okay, whereas *all several issues is ill-formed. I suggest that the cardinals and elements that may cooccur with determiners in the same nominal projection should be distinguished from the category of determiners. For instance, opiadipote (any) and kathe (every) in (31) are analysed as determiners, whereas tria (three) is taken to pertain to the sort *numeral*.

(31) a. opiadipote tria   lastiha
        any   three tyres
        'any three tyres'

   b. kathe tria   hronia
      every three years
      'every three years'

An important difference between numerals and determiners is that only the former qualify as complements of the definite article:

(32) a. ta   dio
        the two
        'the two of these'

   b. *ta merika
      the some

It has often been proposed that the cardinals and elements that pattern alike should be analysed as adjectives (cf. Abney 1987, Giusti 1991 & Giusti 1992). Nevertheless, there is at least one good reason for rejecting this proposal: numerals and adjectives do not have the same distribution. Numerals occur in the left periphery of the phrase and cannot be preceded by adjectives, viz.:

---

[13] It should be noted that an analysis of determiners as heads rather than subcategorized complements of nouns requires modification of the Semantics Principle of HPSG (cf. Pollard and Sag 1994). If we assume that the determiner is the head-daughter of a nominal, the CONTENT value of the mother will be an object of sort *quantifier*, rather than an object of sort *nominal-object*. However, the quantification theory assumed in Pollard and Sag (1994) requires that the CONTENT value of a quantified nominal such as every book is of sort *nominal-object*, like that of book. Both the present account and Netter's approach presuppose a modified Semantics Principle that will assign to quantified nominals content values of sort *nominal-object*.

(33)   *kokina tria   podilata
        red   three bikes
        '*red three bikes'

In what follows, I present an HPSG analysis of numerals that accommodates their distinct properties. This analysis further accounts for the fact that Greek numerals may cooccur with either NPs or APs, as the data in (34) illustrate.

(34) a. Agorasa   tria vivlia.
        bought-1.SG tria books
        'I bought three books.'

     b. Agorasa   tria   aglika   ke   ena eliniko.
        bought-1.SG three English and one Greek
        'I bought three English ones and a Greek one.'

In the account proposed here, numerals are treated as functional heads (FUN+) that subcategorize for a non-functional complement (FUN−) of sort *noun-adj-num*. This is shown in (35).

$$
(35) \quad
\begin{bmatrix}
CAT
\begin{bmatrix}
HEAD
\begin{bmatrix}
CASE\ \boxed{1} \\
FUN+ \\
N-
\end{bmatrix} \\
\\
SUBCAT\ <\ noun-adj-num
\begin{bmatrix} CASE\ \boxed{1}, FUN- \end{bmatrix} : \boxed{2} >
\end{bmatrix} \\
\\
CONT \mid INDEX\ \boxed{2}
\end{bmatrix}
$$

By means of the boolean feature FUN, we segregate the functional and nonfunctional members of sort *noun-adj-num*. The sorts *noun* and *adj* are FUN−, whereas numerals are FUN+. Numerals may cooccur with NPs or APs but not other numerals. If we assume that numerals form a separate class, we will account for ill-formed examples such as (36). Adjectives select exclusively for noun categories that are specified [FUN−, N+]. Therefore, **kokino** (red) in (36) cannot cooccur with a numeral phrase (NumP) such as **dio podilata** (two bikes).

(36)   *kokina dio podilata
        red   two bikes

We also rule out ill-formed examples such as (37) which contain more than one numeral category. The string **pente aglika vivlia** (five English books) is unambiguously analysed as a NumP. Such a phrase, being FUN+, cannot serve as a complement for the leftmost numeral head **diafora** (various).

(37)   *diafora pente aglika   vivlia
        various   five   English books

Moreover, we provide a straightforward account of case concord and agreement in gender and number between the numeral head and its NP or AP complement. Compatibility in case and index is accounted for by structure-sharing. (See $\boxed{1}$ and $\boxed{2}$, respectively, in (35).)

Let us finally consider the content of numerals. In the present approach, numerals and determiners are semantically distinct. Determiners are quantifiers, whereas a non-quantificational analysis is provided for numerals. The semantics of numeral phrases is taken to be parallel to that of plurals, as conceived in Link (1987). Link's logic of plurals assimilates plural objects to individuals, rather than sets of individuals. In particular, Link introduces a sum operation that forms individual sums out of individual terms. A sum term such as $\alpha \oplus \beta$ does not denote the set consisting of α and β but rather another individual of the same semantic type as α and β. Individual sums have individual parts. For example, α is a part of the individual sum $\alpha \oplus \beta$. In effect, Link takes numerals to be semantically on a par with adjectives.

Assuming Link's approach to numerals, the CONTENT value of all the three subsorts of *noun-adj-num*, i.e., *noun*, *adjective* and *numeral*, is an object of sort *nominal-object (nom-obj)*. The sort *nom-obj* bears the attributes INDEX and RESTRICTION (RESTR). The INDEX value is an object of sort *index* and bears the attributes PERSON, NUMBER and GENDER. This type of object is the HPSG analogue of a reference marker in Discourse Representation Theory (DRT), or a parameter introduced by an NP use in Situation Semantics. On the other hand, the restriction set contains *psoas (parametric states of affairs)* that place conditions on the entity that the index can be anchored to or the set of entities it can quantify over. In particular, the RESTR value of adjectives and numerals is a set that results from adding one further restriction imposed by the adjective or numeral to the restrictions imposed by the nominal that the adjective or numeral combines with.

For example, the CONTENT value of the numeral **tria** (three) is as shown in (38), where $\boxed{2}$ stands for the restriction value of the numeral's subcategorized complement:

$$(38) \quad \left[CONT \left[\begin{array}{l} INDEX \; \boxed{1} \left[\begin{array}{l} NUM \; pl \\ GEND \; neut \end{array} \right] \\ RESTR \left\{ \left[\begin{array}{l} RELN \; card-three \\ INST \; \boxed{1} \end{array} \right] \wedge \boxed{2} \right\} \end{array} \right] \right]$$

The numeral **tria** (three) imposes the restriction that the anchor should consist of exactly three individual parts. In addition, the RESTR set of the numeral includes the restrictions placed by its subcategorized complement (tag $\boxed{2}$). Assume that the numeral **tria** eventually combines with the NP **kokina podilata** (red bikes). The RESTR value of **kokina podilata** is as follows:

$$(39) \quad \left[RESTR \left\{ \left[\begin{array}{l} RELN \; red \\ INST \; \boxed{1} \end{array} \right] , \left[\begin{array}{l} RELN \; bike \\ INST \; \boxed{1} \end{array} \right] \right\} \right]$$

Then, by structure-sharing, the numeral's RESTR value will be fleshed out as shown in (40). In a referential use of the phrase **tria kokina podilata** (three red bikes), the index must be

anchored to an individual sum of red bikes that has exactly three individual parts.

$$
(40) \quad \left[RESTR \left\{ \begin{bmatrix} RELN\ card-three \\ INST\ \boxed{1} \end{bmatrix}, \begin{bmatrix} RELN\ red \\ INST\ \boxed{1} \end{bmatrix}, \begin{bmatrix} RELN\ bike \\ INST\ \boxed{1} \end{bmatrix} \right\} \right]
$$

4   Definiteness and polydefiniteness: an HPSG approach

An important hypothesis assumed in the current analysis is that the Greek definite article is not a member of the class of determiners, but constitutes an individual category: *def*. Though both the definite article and determiners in Greek syntactically combine with the same range of nominal categories, i.e. noun, adjective, and numeral projections, only the definite article appears in constructions that have been referred to as polydefinites. Viz.:

(41) a. to   podilato to kokino
      def bike   *def* red
      'the red bike'

    b. to   kenurio podilato to kokino
        def new   bike   *def* red
        'the new red bike'

In this work, I propose that the definite article in Greek does not "project", or, in other words, it does not determine the syntactic category of the phrase it occurs in. Rather, it is a "marker of definiteness": it may mark definite noun phrases (NPs), adjective phrases (APs), or numeral phrases (NumPs). Under this view, polydefinites are instances of *definite concord*: the daughter constituents of these phrases agree in "definiteness", i.e. they are all definite phrases. For example, the polydefinite NP in (41a) consists of a definite noun **to podilato** (the bike) and a definite adjective **to kokino** (the red), and the polydefinite NP in (41b) consists of a definite NP **to kenurio podilato** (the new bike) and a definite adjective **to kokino**. In the following sections, I provide a formal account of definiteness and polydefiniteness in HPSG.

4.1   A non-quantificational analysis of definites in HPSG

The definite article analysis that I propose in this work relies crucially on a non- quantificational approach to definiteness, the one provided in Gawron and Peters (1990). In their work, definiteness is associated with uniqueness, in a "local" or relative sense. For instance, the referent of a definite nominal **the book** is taken to be the unique entity that has the property of being a book in a contextually salient situation. That is, on Gawron and Peters's view, an entity can be "unique" and carry unique properties, only inside a local setting—the setting we pick for a particular referential use of a definite nominal. Following Barwise and Perry (1983), Gawron and Peters make use of the idea of a *resource situation* in the analysis of nominals. This is a contextually available situation that provides entities for reference and quantification. Each (referential) use of a definite or indefinite nominal is taken to invoke a

resource situation. However, in case of definites, the resource situation is restricted. Uniqueness in Gawron and Peter's analysis of definites is relative to the resource situation associated with a given use of a definite nominal. More precisely, what the definite article semantically contributes to an NP utterance, is a relation UNIQUE that imposes a restriction on the resource situation for that utterance. To illustrate, the resource situation of a definite such as the book is restricted so that it contains a unique exemplar of the property BOOK. On the other hand, the resource situation of an indefinite such as a book is essentially unrestricted. Indefinites place no special restrictions on their resource situations. Then, there may be more than a single BOOK entity in the resource situation associated with the indefinite a book.[14] In what follows, I formulate Gawron and Peters's proposal in terms of HPSG.

In the current system, uniqueness is expressed in terms of a boolean feature UNIQUE that is defined for objects of sort *nominal-object (nom-obj)*. A specification UNIQUE+ indicates that the referent of a (definite) nominal uniquely instantiates a certain property—the property that the nominal denotes—in a contextually salient situation (the resource situation). Alternatively, UNIQUE− signifies that no such restriction needs to be satisfied. Rather, there may be more than a single entity in the resource situation bearing the property that the (indefinite) nominal denotes. The updated version of *nom-obj* is as follows:

$$(42) \qquad nom - obj : \begin{bmatrix} INDEX \ index \\ RESTR \ set(psoa) \\ UNIQUE \ boolean \end{bmatrix}$$

The revised sort *nom-obj* bears the following features:

- The feature INDEX: its value is an object of sort *index* and conveys the agreement features NUMBER, GENDER, and PERSON. In a referential use of a nominal, the index is anchored to an entity in the discourse.

- The feature RESTR(ICTION): its set value contains *psoas (parametric states of affairs)* that impose restrictions on the anchor of the index.

- The feature UNIQUE which imposes a further restriction on the anchor of the index if its value is *plus* (+).[15]

The AVM in (43) shows the CONTENT value (of sort *nom-obj*) of the indefinite nominal a book. In a referential use of a book, the anchor must be a book, as required by the restriction *psoa* in (43).

---

[14] In Gawron and Peters's analysis, in case of non-referential uses of definites and indefinites, e.g. every class loves the teacher, the definite (or indefinite) nominal still introduces a referential index, which, however, is existentially quantified away at the VP or S level, by a Closure operator. Then, in such cases, definites and indefinites are treated analogously to existential quantifiers.

[15] In the HPSG formulation of Gawron and Peters's proposal that I provide here, no feature structure directly models the *resource situation*. This is because the HPSG ontology does not include (Austinian) propositions, where situations support states of affairs, rather only states of affairs are employed (e.g. the *psoas* of the RESTR attribute). However, the specification UNIQUE+ is to be construed in the Gawron and Peters's sense: it denotes that there is a unique referent that rends factual the restriction *psoas* inside the situation that supports these states of affairs.

(43)

$$
nom-obj
\begin{bmatrix}
INDEX\ \boxed{1}\ [NUM\ sg] \\[2ex]
RESTR\ \left\{
\begin{bmatrix}
RELN\ book \\[1ex]
INST\ \boxed{1}
\end{bmatrix}
\right\} \\[3ex]
UNIQUE-
\end{bmatrix}
$$

Consider next the definite **the book** in (44). The anchor of this nominal must be a book, and, moreover, it must be the unique book in the resource situation. This is encoded by the UNIQUE+ specification.

(44)

$$
nom-obj
\begin{bmatrix}
INDEX\ \boxed{1}\ [NUM\ sg] \\[2ex]
RESTR\ \left\{
\begin{bmatrix}
RELN\ book \\[1ex]
INST\ \boxed{1}
\end{bmatrix}
\right\} \\[3ex]
UNIQUE+
\end{bmatrix}
$$

Let us next turn to a couple of more complex examples. The AVM in (45) illustrates the CONTENT value of the indefinite **a book that Kim gave to Sandy**. (Tags $\boxed{2}$ and $\boxed{3}$ stand for the index values of the thematic roles of the verb **give** in the relative clause, and $\boxed{2}$ is associated with Kim, while $\boxed{3}$ is associated with Sandy).

(45)

$$
\begin{bmatrix}
INDEX\ \boxed{1} \\[2ex]
RESTR\ \left\{
\begin{bmatrix}
RELN\ book \\[1ex]
INST\ \boxed{1}
\end{bmatrix},
\begin{bmatrix}
RELN\ give \\[1ex]
GIVER\ \boxed{2} \\[1ex]
GIVEN\ \boxed{1} \\[1ex]
GIVEE\ \boxed{3}
\end{bmatrix}
\right\} \\[4ex]
UNIQUE-
\end{bmatrix}
$$

In a referential use of the NP **a book that Kim gave to Sandy**, the index $\boxed{1}$ must be anchored to an entity that renders factual each *psoa* in the set value of RESTR. That is, $\boxed{1}$ must be anchored to a book that an entity named Kim gave to an entity named Sandy. The property

denoted by the referent of **a book that Kim gave to Sandy** is a complex one, and it derives by conjoining the RESTR psoas and abstracting over the index $\boxed{1}$. To obtain this property, I assume a function $f_{prop-ob}$ which is as follows:

(46) $f_{prop-ob}(x, psoa_1, ..., psoa_n) = \lambda x(psoa_1 \wedge ... \wedge psoa_n)$

For g = (INDEX : $\boxed{1}$; RESTR : [book $\boxed{1}$] , [give, $\boxed{2}$, $\boxed{1}$, $\boxed{3}$]), (where, *book* and *give* stand for RELN *book* and RELN *give*, respectively), $f_{prop-ob}$(g) yields:

$\lambda \boxed{1}$ ([book $\boxed{1}$] $\wedge$ [give, $\boxed{2}$, $\boxed{1}$, $\boxed{3}$]), and this is the property that the referent of **a book that Kim gave to Sandy** is required to instantiate.

Consider next the CONTENT value of the definite **the book that Kim gave to Sandy**.

(47)

$$
\begin{bmatrix}
INDEX\ \boxed{1} \\[2pt]
RESTR\ \left\{ \begin{bmatrix} RELN\ book \\ INST\ \boxed{1} \end{bmatrix}, \begin{bmatrix} RELN\ give \\ GIVER\ \boxed{2} \\ GIVEN\ \boxed{1} \\ GIVEE\ \boxed{3} \end{bmatrix} \right\} \\[2pt]
UNIQUE+
\end{bmatrix}
$$

The specification UNIQUE+ imposes a further restriction on the anchor of the index. It requires that for any anchor that renders factual the psoas in the RESTR set, the property obtained by conjoining the psoas and abstracting over the index ($\boxed{1}$) should be *uniquely* instantiable. Thus, in a referential use of the phrase **the book that Kim gave to Sandy**, there an entity in the resource situation that is the *unique* book that an entity named Kim gave to an entity named Sandy. Thus:

UNIQUE ($\lambda \boxed{1}$ ([book $\boxed{1}$] $\wedge$ [give , $\boxed{2}$, $\boxed{1}$, $\boxed{3}$])).

It should be finally noted that the current proposal does not concern only definite NPs. Rather, it further accounts for definite APs or NumPs. Consider for instance the definite adjective **to kokino** (the red) from Greek. The content value of sort *nom-obj* for **to kokino** is given in (48). This feature structure denotes that the property *red* is uniquely instantiable in a local setting.

(48)

$$
\begin{bmatrix}
INDEX\ \boxed{1} \\[2pt]
RESTR\ \left\{ \begin{bmatrix} RELN\ red \\ INST\ \boxed{1} \end{bmatrix} \right\} \\[2pt]
UNIQUE+
\end{bmatrix}
$$

Similarly for the definite numeral **ta dio** (the two). The *nom-obj* in (49) denotes that there is a unique individual sum in the resource situation with exactly two individual parts:

$$(49) \quad \begin{bmatrix} INDEX\ \boxed{1} \\[2mm] RESTR\ \left\{ \begin{bmatrix} RELN\ card-two \\[2mm] INST\ \boxed{1} \end{bmatrix} \right\} \\[2mm] UNIQUE+ \end{bmatrix}$$

In this section, I have sketched a non-quantificational approach to definites for HPSG, one that incorporates Gawron and Peter's proposal that the definite article does not introduce a quantifier force, but rather a uniqueness entailment. In the following section, I focus on the syntactic properties of the definite article in Greek and demonstrate how exactly it assigns a uniqueness requirement to the nominal it occurs in.

4.2   The definite article as an adjunct

In the current system, the definite article (*def*) is not taken to be the syntactic head of the phrase it occurs in. Rather, the head daughter of a definite phrase is the nominal that *def* combines with. The definite article may syntactically combine with a wide range of nominal categories: the sorts *noun*, *adjective* and *numeral*. Thus, definite NPs, APs and NumPs are generated. Nonetheless, *def* makes a semantic contribution. I propose that *def* places a restriction on the referent of definite nominals: the anchor of a definite phrase's index must be an entity that uniquely instantiates the property denoted by this phrase, in a contextually available situation. In other words, the definite article makes a nominal UNIQUE+.

The properties of the Greek definite article can be naturally captured in HPSG terms by treating *def* as an adjunct. Adjuncts in HPSG are functors that take a head as their argument. Moreover, they affect the content of the phrase they occur in: adjuncts that combine with a nominal object (a head with a content value of sort *nom-obj*) add a restriction to the restriction set of that nominal object. This is exactly what *def* does as well: like other adjuncts, for instance, adjectives or relative clauses, the definite article restricts the reference of the nominal it makes part of. (50) below is a skeletal illustration of the CATEGORY and CONTENT values of **to** (the-SG.NEUT). Tag $\boxed{2}$ stands for the object (of sort *synsem*) given in (51). This object is the actual MOD value of **to** in place of $\boxed{2}$, and tags $\boxed{1}$, $\boxed{3}$ and $\boxed{4}$ indicate that certain features of **to** and the object that serves as its MOD value are identical. I cite the two objects separately in (50) and (51) for expository clarity.

$$
(50) \quad
\begin{bmatrix}
CAT & \begin{bmatrix} HEAD\ def \begin{bmatrix} CASE\ \boxed{1}\ acc \\ FUN+ \\ MOD\ \boxed{2} \end{bmatrix} \\ \\ SUBCAT\ <\ > \end{bmatrix} \\ \\
CONT & \begin{bmatrix} INDEX\ \boxed{3}\ \begin{bmatrix} NUM\ sing \\ \\ GEND\ neut \end{bmatrix} \\ \\ RESTR\ \boxed{4} \\ \\ UNIQUE+ \end{bmatrix}
\end{bmatrix}
$$

The CAT and CONT values of to *(the-*SG.NEUT*)*

$$
(51) \quad \boxed{2}
\begin{bmatrix}
CAT\ |\ HEAD\ noun-adj-num\ \begin{bmatrix} CASE\ \boxed{1} \end{bmatrix} \\ \\
CONT\ \begin{bmatrix} INDEX\ \boxed{3} \\ \\ RESTR\ \boxed{4} \\ \\ UNIQUE- \end{bmatrix}
\end{bmatrix}
$$

The MOD value of to

As illustrated in (50), the HEAD value of to is an object of sort *def*. Recall that *def* is a subsort of *nominal*, hence, it inherits the feature declaration of the latter. The feature CASE denotes the morphological case of a given form of *def*. The specification FUN+ signifies that *def* is a functional subsort of nominal, like determiners and numerals. By means of the feature MOD (modified), *def* selects for a sister nominal. As shown in (51), *def* requires that the HEAD value of the category it selects by MOD should be an object of sort *noun-adj-num*. That is, *def* essentially selects for a noun, adjective or numeral projection, for these three sorts are subsorts of *noun-adj-num* that exhaust *noun-adj-num*. Given that any of the categories *noun*, *adjective* and *numeral* qualifies as an argument of *def*, we account for examples such as those in (52). In (52a) to cooccurs with an NP kokino podilato (red bike), in (52b) it cooccurs with an adjective kokino (red), and in (52c) it cooccurs with a NumP dio kokina podilata (two red bikes).

(52) a. to   kokino podilato
      def new   bike
      'the new bike'

   b. Ehi   dio podilata. Mu danise   to   kokino.
      has-3.SG two bikes.   me lent-3.SG *def* red
      '(S)he has two bikes. (S)he lent me the red one.'

    c. ta dio kokina podilata
      def two red   bikes
      'the two red bikes'

Case concord and agreement in number and gender between *def* and the nominal it combines with are accounted for straightforwardly. The CASE value of *def* and that of its selected sister are required to be token-identical by structure-sharing (see tag $\boxed{1}$ in (50) and (51)). Similarly for their INDEX values that bear the features NUMBER and GENDER (see tag $\boxed{3}$ in (50) and (51)). Thus, the neuter to cannot combine say with the noun karekla (chair) or the adjective kokini (red) etc. which are feminine in gender.

A further important point is that *def* introduces no restriction psoas. Notice that the restriction value $\boxed{4}$ of to in (50) is structure-shared with that of its selected sister in (51). Therefore, the psoas in the restriction set of the definite article originate from the category it combines with. However, *def* does impose a restriction on the anchor of a definite nominal's index. This is the feature specification UNIQUE+. In the approach proposed here, the definite article is the semantic head of the phrase it makes part of. This means that the content value of a definite phrase originates from the definite article, rather than its nominal sister. However, this is not a special requirement that exclusively applies for definite phrases, rather it is a general property of phrases consisting of an adjunct constituent and a head constituent, and it is expressed in terms of HPSG's Semantics Principle (see below). Since *def* is the semantic head, a definite phrase will be specified UNIQUE+, like the definite article, and moreover, it will carry the restrictions of the definite article's syntactic sister (i.e. an NP, AP or NumP) that are incorporated in the definite article's content.

Finally, notice that *def* selects for a UNIQUE− nominal (see (51)). It follows that definite NPs, APs, or NumPs do not qualify as syntactic sisters for *def*, since such nominals are specified UNIQUE+. Therefore, we rule out ill-formed strings such as (53).

(53)   *to to kenurio podilato
         def def new   bike

A phrase consisting of a definite article and a noun, adjective or numeral projection is licensed by the Immediate Dominance (ID) Schema 5, cf. Pollard and Sag (1994), given in (54).

(54)   *Schema 5 (Head-Adjunct Schema).* A phrase with DTRS value of sort *head-adjunct-structure*, such that the MOD value of the adjunct daughter is token-identical to the SYNSEM value of the head daughter.

By way of illustration, we next consider the feature structure generation of the monadic definite to kokino podilato (the red bike), admitted by the Head-Adjunct Schema. The monadic definite to kokino podilato in (57) consists of an adjunct daughter to and an NP head-daughter kokino podilato. Being an NP (**HEAD** *noun*), and, therefore, a subsort of *noun-adj-num*, kokino podilato is an appropriate category for the definite article to "modify". Moreover, kokino podilato is indefinite (UNIQUE−), and identical in case and agreement features to the definite article to (see $\boxed{3}$ and $\boxed{4}$, respectively). We can further see in (57) that the

restriction psoas of **kokino podilato** $\boxed{5}$ are incorporated in the definite article's content: the definite article's restriction is identical to the restriction of the synsem object $\boxed{6}$ that MOD takes as its value, and this is lexically specified. The head value $\boxed{1}$ of the NP daughter **kokino podilato** propagates onto the mother by the Head Feature Principle, repeated below for convenience.
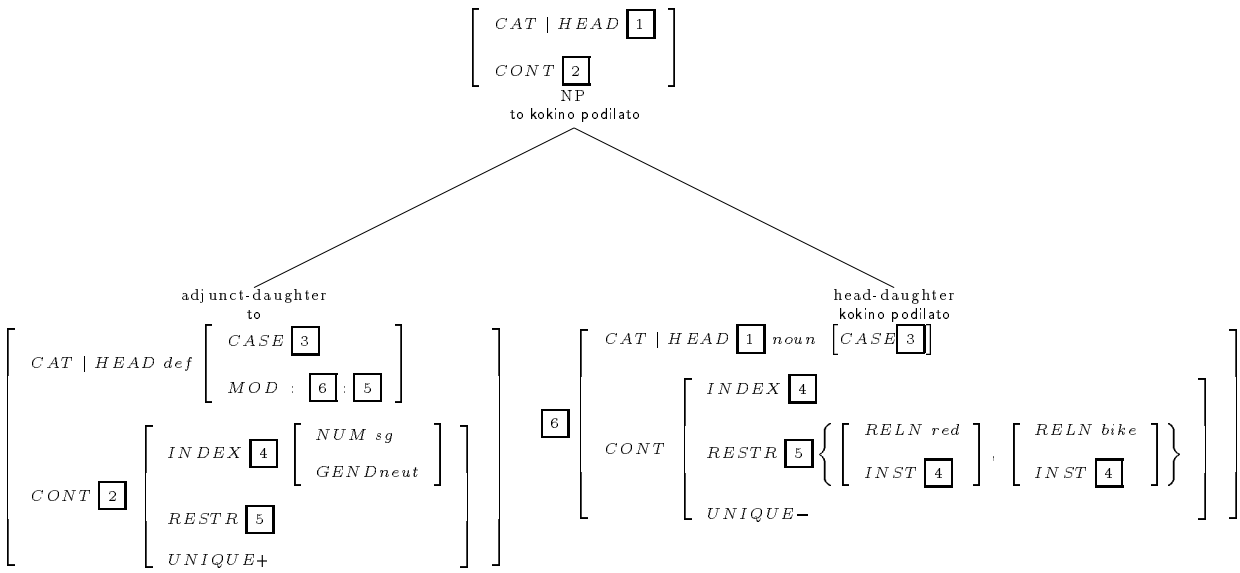
(55)   *The Head Feature Principle (HFP).* In a headed phrase, the values of SYNSEM | LOCAL | CATEGORY | HEAD and DAUGHTERS | HEAD-DAUGHTER | SYN-SEM | LOCAL | CATEGORY | HEAD are token-identical.

The content value $\boxed{2}$ of the definite article that carries the specification UNIQUE+ and incorporates the restrictions due to the head-daughter propagates onto the mother by the Semantics Principle (56):

(56)   *The Semantics Principle.* In a headed phrase, the CONTENT value is token-identical to that of the adjunct daughter if the DTRS value is of sort *head-adj-struc*, and with that of the head daughter otherwise.

The CONTENT value of **to kenurio podilato** (the red bike) signifies that in a referential use of the phrase, the index must be anchored to an entity that is the unique instantiation of the property *new bike* in a local setting.

(57)   *The monadic definite* **to kokino podilato** *(the red bike)*

$$
\begin{bmatrix} CAT \mid HEAD & \boxed{1} \\ CONT & \boxed{2} \end{bmatrix}
$$

NP
to kokino podilato

adjunct-daughter
to

$$
\begin{bmatrix} CAT \mid HEAD \; def & \begin{bmatrix} CASE & \boxed{3} \\ MOD & : \; \boxed{6} : \boxed{5} \end{bmatrix} \\ CONT \; \boxed{2} & \begin{bmatrix} INDEX & \boxed{4} \begin{bmatrix} NUM \; sg \\ GEND \; neut \end{bmatrix} \\ RESTR & \boxed{5} \\ UNIQUE+ \end{bmatrix} \end{bmatrix}
$$

head-daughter
kokino podilato

$$
\boxed{6} \begin{bmatrix} CAT \mid HEAD \; \boxed{1} \; noun & \begin{bmatrix} CASE \; \boxed{3} \end{bmatrix} \\ CONT & \begin{bmatrix} INDEX & \boxed{4} \\ RESTR & \boxed{5} \left\{ \begin{bmatrix} RELN \; red \\ INST \; \boxed{4} \end{bmatrix}, \begin{bmatrix} RELN \; bike \\ INST \; \boxed{4} \end{bmatrix} \right\} \\ UNIQUE- \end{bmatrix} \end{bmatrix}
$$

In this section, I have presented an HPSG analysis of the Greek definite article as an adjunct. Like other types of adjuncts that modify nominal projections, the definite article in Greek does not affect the syntactic category of the phrase it makes part of. Rather, its contribution is semantic, and it is expressed in terms of uniqueness entailments, in the sense of Gawron and Peters (1990). In this approach, the definite article is indeed a marker of definiteness: it marks definite the nominal category it appears in. In addition, "definite marking" is assigned a precise semantic interpretation: a definite nominal has a referent that uniquely instantiates the property that the nominal denotes inside the resource situation. In the following section, we consider a treatment of polydefinites, which naturally derives from the current approach to the definite article.

4.3   Polydefiniteness as definite concord

In the previous section, it was shown that the Greek definite article may syntactically combine with a noun, adjective or numeral category and yield a definite NP, AP or NumP, respectively. In this section, I demonstrate how a definite AP may syntactically combine with a definite NP, thus yielding a polydefinite. I assume an analysis of adjectives that basically relies on Pollard and Sag (1994), and moreover incorporates the UNIQUE attribute. The AVM in (58) shows the CATEGORY and CONTENT attributes of the English adjective **red**, in Pollard and Sag's (1994) account.

$$
(58) \quad
\begin{bmatrix}
CAT & \begin{bmatrix} HEAD\ adj & \begin{bmatrix} MOD\ \bar{N} & \begin{bmatrix} INDEX\ \boxed{1} \\ RESTR\ \boxed{2} \end{bmatrix} \\ PRD- \end{bmatrix} \\ SUBCAT\ <\ > \end{bmatrix} \\[2em]
CONT & \begin{bmatrix} INDEX\ \boxed{1} \\ RESTR\ \left\{ \begin{bmatrix} RELN\ red \\ INST\ \boxed{1} \end{bmatrix} \right\} \wedge \boxed{2} \end{bmatrix}
\end{bmatrix}
$$

As shown in (58), in Pollard and Sag (1994), adjectives select for an $\bar{N}$, in terms of their MOD feature.[16] The index value of this $\bar{N}$ is required to be identical to the index value of the adjective, by structure-sharing (see tag $\boxed{1}$). In addition, adjectives incorporate the restriction psoas of the noun projection they select: the restriction value of the selected $\bar{N}$ $\boxed{2}$ is added to the restriction value of the adjective. This object ($\boxed{2}$ in case of (58)) is instantiated once the

---

[16] $\bar{N}$ is an abbreviation for HEAD *noun*, SUBCAT ⟨ DetP ⟩. In Pollard and Sag (1994), $\bar{N}$s are noun phrases that have not yet taken their determiner complement.

adjective actually combines with an $\bar{N}$, by the Head-Adjunct Schema.[17] By the Semantics Principle, the conjunction of the adjective's restriction psoas propagates on the mother. To illustrate, if **red** eventually combines with the noun **book**, the CONTENT value of **red book** is the following feature-structure:

$$
(59) \quad
\left[CONT \left[\begin{array}{l} INDEX \;\boxed{1} \\[1em] RESTR \; \left\{ \left[\begin{array}{l} RELN \; red \\ INST \;\boxed{1} \end{array} \right] , \left[\begin{array}{l} RELN \; book \\ INST \;\boxed{1} \end{array} \right] \right\} \end{array} \right] \right]
$$

For our own purposes, we slightly modify Pollard and Sag's analysis of adjectives: we assume that (indefinite) adjectives such as **kokino** (red) are in addition specified for the feature UNIQUE.[18] Consider the AVM in (60):

$$
(60) \quad
\left[\begin{array}{l} CAT \left[\begin{array}{l} HEAD \; adj \left[\begin{array}{l} MOD \; noun : \left[\begin{array}{l} INDEX \;\boxed{1} \\ RESTR \;\boxed{2} \\ UNIQUE- \end{array} \right] \\[2em] PRD- \end{array} \right] \\[4em] SUBCAT \; < \; > \end{array} \right] \\[6em] CONT \left[\begin{array}{l} INDEX \;\boxed{1} \\[1em] RESTR \; \left\{ \left[\begin{array}{l} RELN \; red \\ INST \;\boxed{1} \end{array} \right] \right\} \wedge \boxed{2} \\[2em] UNIQUE- \end{array} \right] \end{array} \right]
$$

The adjective **kokino** is UNIQUE−. That is, the anchor of its index is not required to be the unique instance of the property RED in the resource situation. The noun projection that **kokino** selects via the feature MOD is required to be UNIQUE− too. This is lexically specified by structure-sharing, like it is lexically specified that the adjective and the selected noun category

---

[17] As we saw in the previous section, this schema stipulates identity between the adjunct's MOD value and the head's synsem. Therefore, once the adjunct's MOD value is instantiated, the restrictions coming from the $\bar{N}$ and that are incorporated in the adjunct's content are also instantiated.

[18] A further difference between Pollard and Sag's analysis of adjectives and the one assumed here is that in the latter adjectives do not select for $\bar{N}$s, in the sense of Pollard and Sag (1994) (see above), rather, they select for a category specified HEAD *noun*, which may be a word or a phrase. This has certain advantages over the Pollard and Sag account (for discussion, see Kolliakou 1995).

should carry identical index values (see $\boxed{1}$). Therefore, **kokino** will not modify, for example, the definite NP **to podilato** (the bike). The latter is UNIQUE+, due to the definite article **to**, and invokes a particular resource situation in which some entity is the unique bike. Thus, ill-formed examples due to clash in definiteness are excluded:

(61)　a.　*kokino to podilato
　　　　　　red　　*def* bike

　　　　b.　*to podilato kokino
　　　　　　def bike　　　red

The adjective **kokino** may instead modify the indefinite noun **podilato**. In this case, no clash occurs since both the adjunct and the noun head are UNIQUE−. Hence:

(62)　a.　kokino podilato
　　　　　　red　　bike
　　　　　　'a red bike'

　　　　b.　podilato kokino
　　　　　　bike　　　red
　　　　　　'a red bike'

The CONTENT value of the indefinite NP **kokino podilato** (red bike) is as follows:

$$
(63)\quad
\left[
CONT
\left[
\begin{array}{l}
INDEX\ \boxed{1}\\[2ex]
RESTR\ \left\{
\left[
\begin{array}{l}
RELN\ red\\
INST\ \boxed{1}
\end{array}
\right],
\left[
\begin{array}{l}
RELN\ bike\\
INST\ \boxed{1}
\end{array}
\right]
\right\}\\[3ex]
UNIQUE-
\end{array}
\right]
\right]
$$

The definite article *def* may in principle cooccur with the NPs in (62) above. Recall that *def* selects for an argument of sort *noun-adj-num*, which subsumes projections of *noun*, *adjective* and *numeral*. In addition, *def* requires that the nominal it combines with should be UNIQUE−.[19]

Consider next the definite adjective **to kokino** (the red).

---

[19]In fact, *def* may cooccur only with the NP in (62a):

(64)　a.　to kokino podilato
　　　　　　def red　　bike
　　　　　　'the red bike'

$$(65)\quad \begin{bmatrix} CAT & \begin{bmatrix} HEAD\ adj & \begin{bmatrix} MOD\ noun : & \begin{bmatrix} INDEX\ \boxed{1} \\ RESTR\ \boxed{2} \\ UNIQUE+ \end{bmatrix} \\[2ex] PRD- \end{bmatrix} \\[4ex] SUBCAT\ <\ > \end{bmatrix} \\[8ex] CONT & \begin{bmatrix} INDEX\ \boxed{1} \\[1ex] RESTR\ \left\{ \begin{bmatrix} RELN\ red \\ INST\ \boxed{1} \end{bmatrix} \right\} \wedge \boxed{2} \\[2ex] UNIQUE+ \end{bmatrix} \end{bmatrix}$$

The AP **to kokino** (the red) is UNIQUE+ due to the semantic contribution of **to** (the-SG.NEUT). The UNIQUE+ specification signifies that the property RED is uniquely instantiable in a local setting (the resource situation). The noun projection that **to kokino** selects for via the feature MOD is also UNIQUE+.[20] When a definite adjective such as **to kokino** syntactically combines with a definite NP they yield a polydefinite. The generation of the polydefinite NP **to podilato to kokino** (the bike the red; 'the red bike') is schematically illustrated in the following tree-diagram.

(66)

```
                       NP UNIQUE+
                      /          \
            NP UNIQUE+            AP UNIQUE+
            /        \            /        \
       adjunct      head      adjunct      head
        def         noun        def         adj
      UNIQUE+     UNIQUE-     UNIQUE+     UNIQUE-
```
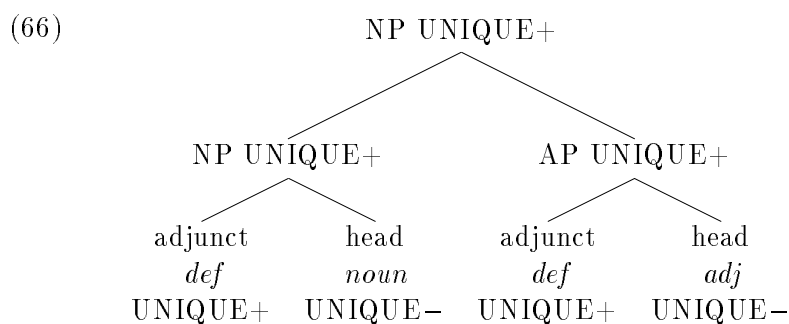
Polydefiniteness is a natural consequence of the fact that adjectives in Greek "agree" in definiteness with the nouns they modify, like they agree in other features, for instance, number

---

  b. *to podilato kokino
   def bike red

The contrast in (64) indicates that there are certain word order constraints in monadic definites in Greek. For an HPSG account of such contrasts, see Kolliakou (1995).

[20] In fact, this is required by the Uniqueness Principle, see Section 6 below.

and gender. In this sense, the polydefinite construction is an instance of "definite concord". It is entirely straightforward to account for this type of definite concord, once we assume the approach to definiteness presented in the previous sections.

The polydefinite **to podilato to kokino** (the bike the red; 'the red bike') is a noun projection, i.e., its head value is an object of sort *noun*. This value comes from the head daughter, the monadic definite **to podilato** (the bike), by the Head Feature Principle. Being an NP, **to podilato to kokino** can be modified by a further definite adjective. Thus, a polydefinite that contains more than two definite articles is generated, e.g.:

(67)   to   kenurio to   podilato to   kokino
         def new   *def* bike   *def* red
         'the new red bike'

In a referential use of **to kenurio to podilato to kokino**, the anchor must be an entity that is the unique new red bike in a contextually salient situation. This condition is imposed by the restriction *psoas*, and, in addition, the UNIQUE+ specification. The CONTENT value of this NP is as follows:

(68)

$$
\begin{bmatrix}
CONT & \begin{bmatrix}
INDEX\ \boxed{1} \\
RESTR\ \left\{ \begin{bmatrix} RELN\ new \\ INST\ \boxed{1} \end{bmatrix}, \begin{bmatrix} RELN\ red \\ INST\ \boxed{1} \end{bmatrix}, \begin{bmatrix} RELN\ bike \\ INST\ \boxed{1} \end{bmatrix} \right\} \\
UNIQUE+
\end{bmatrix}
\end{bmatrix}
$$

In this section, I have presented an account of polydefinite NPs. I will demonstrate next how other nominal categories i.e. demonstratives, numerals and determiners can be incorporated in this account.

5   Demonstratives, numerals and determiners in definites and polydefinites

5.1   Greek demonstratives as inherently definite nominals

In this section, I argue that an analysis of Greek demonstratives as definite (UNIQUE+) nominal categories enables their distribution to be accounted for in a very straightforward manner. Consider (69) and (70). The former demonstrates that the definite article *(def)* cannot attach to a demonstrative. The contrast in (70) shows that demonstratives exclusively occur in definites phrases.

(69)   *to afto to podilato
         def this *def* bike

(70) a. afto to podilato
      this *def* bike
      'this bike'

   b. *afto podilato
      this bike

If we assume that demonstratives are definite, both these facts can be explained. First, we as have seen, the definite article does not cooccur with definite nominals: *def* selects for a UNIQUE− argument. Moreover, demonstratives are excluded from indefinite phrases so that definite concord is not violated. Ill-formed strings such as (70b) and (71) below are ruled out for similar reasons. In the former, an indefinite noun category (**podilato** 'bike') cooccurs with the inherently definite demonstrative. In the latter, the indefinite adjective **kokino** (red) appears to modify the definite NP **to podilato** (the bike). The requirement for definite concord is violated in either case.

(71)   *to kenurio kokino to podilato
        def new   red   *def* bike

The AVM in (72) is a skeletal illustration of the CATEGORY and CONTENT value of the demonstrative **afto** (this-SG.NEUT). (For expository clarity, only relevant features are included).

$$(72)\quad \begin{bmatrix} CAT \begin{bmatrix} HEAD\ dem \begin{bmatrix} FUN+ \\ N- \end{bmatrix} \\ \\ SUBCAT\ <\ noun-adj-num[UNIQUE+]\ > \end{bmatrix} \\ \\ CONTENT\ |\ UNIQUE+ \end{bmatrix}$$

In the current system, demonstratives are treated as heads that subcategorize for a complement of sort *noun-adj-num*. Therefore, we account for examples such as the ones in (73): in (73a), **afta** cooccurs with an NP (**ta podilata**), in (73b), it cooccurs with an AP (**to kokino**), and in (73c), **afta** appears to be in construction with an NumP (**ta dio**).

(73) a. afta ta podilata
      these *def* bikes
      'these bikes'

   b. agorasa   afto to kokino
      bought-1.SG this *def* red
      'I bought this red one.'

c. agorasa   afta ta dio
   bought-1.SG these *def* two
   'I bought these two.'

A further important point in the analysis of demonstratives provided here is that they are *lexically* specified as UNIQUE+. In this respect, they differ from noun, adjective and numeral categories that are *prima facie* UNIQUE− and turn into UNIQUE+ by the mediation of the definite article.[21] In addition, definite concord between a demonstrative and its nominal complement is lexically specified: as illustrated in (72), the demonstrative requires that the UNIQUE value of its subcategorized complement should be *plus* (+). Hence, ill-formed examples such as (75) (repeating (70b)) are ruled out.

(75)   *afto podilato
       this   bike

Demonstratives are subsumed under a distinct sort *demonstrative (dem)*. As will be shown below, this sort is a subsort of *det-nondet*, and, therefore, inherits the feature declaration of the latter (i.e. the features CASE, FUN, MOD, PRD and their sort values). Demonstratives are functional categories (FUN+), like determiners and numerals. However, they differ from numerals in that they may syntactically combine with any category of sort *noun-adj-num*, rather than only non-functional members of this sort.[22] On the other hand, determiners admit phrases headed by demonstratives (DemPs), in addition to NP, AP and NumP complements. E.g.:

(76)   ola afta   ta podilata
       all   these *def* bikes
       'all these bikes'

The lattice in (77) illustrates the hierarchy of nominal categories for Greek, as modified so as to accommodate demonstratives.

---

[21] By analysing demonstratives as UNIQUE+, we make the claim that they are associated with a uniqueness requirement. It has been pointed out that nominals such as this woman in American English are on a par with indefinites, in a context such as (74):

(74)   I was sitting quietly in the half-empty theater when suddenly *this woman* comes close and...

   However, no such use is available for the corresponding Greek example.

[22] As was shown in Section 3.3 above, numerals are compatible only with the non-functional members of *noun-adj-num*: noun and adjective projections.

(77)   *nominal*
         ╱╲
      def   *det − nondet*
              ╱╲
         det   *dem − nondem*
                 ╱╲
            dem   *noun − adj − num*
                    ╱│╲
               noun *adj* *num*
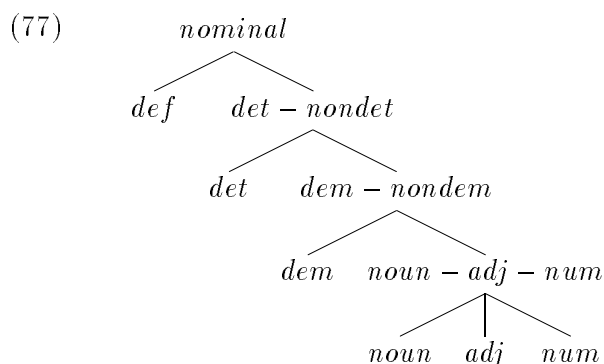
Lattice for Greek nominal categories
(updated)

A new sort *demonstrative-nondemonstrative (dem-nondem)* is introduced in the hierarchy of nominals. This sort partitions into *dem* (the sort of demonstratives) and *noun-adj-num* (the sort subsuming noun, adjective and numeral categories). We assume a further minor modification: determiners subcategorize for a complement with a head value of sort *dem-nondem*, rather than *noun-adj-num*. Thus, we account for the whole range of determiner complements, including DemPs (see (76) above). Treating demonstratives as a distinct class (*dem*) will also enable us to rule out ill-formed examples with more than a single demonstrative. To illustrate, in (78) below, the string **afto to podilato** (this the bike) is analysed as a demonstrative phrase with the demonstrative **afto** as its head-daughter and the definite NP as its complement-daughter. However, the leftmost demonstrative **ekino** (that) cannot take a DemP as its complement, rather it requires a member of *noun-adj-num*. Therefore, our grammar will not generate ill-formed examples such as (78).

(78)   *ekino afto to podilato
          that   this *def* bike

The account of Greek demonstratives sketched above can also serve as an illustration of the advantages of a grammar making use of sort hierarchies. Such a grammar can be easily adapted or expanded: in order to incorporate a new sort, the existing sorts are minimally affected.

5.2   Numeral phrases and definite concord

In various places in the previous sections, we have seen examples of numeral phrases (NumPs) that are monadic definites, e.g.:

(79)   ta dio kokina podilata

          'the two red bikes'

Such phrases are taken to consist of a *def* adjunct daughter (in this case, **ta**) and a NumP head daughter (in this case, **dio kokina podilata** 'two red bikes'). The sort *numeral*, which subsumes the cardinals and nominals that pattern alike, is a subsort of *noun-adj-num*. As we have seen, the definite article selects for *noun-adj-num* categories, therefore, it may syntactically combine with a numeral and yield a definite NumP.

However, in addition to monadic definite NumPs, we also find indefinite and polydefinite NumPs. Consider for instance the examples in (80). In (80a), both the numeral (**dio**) and the noun category (**podilata**) are indefinite. By contrast, the examples in (80b&c) consist of a definite numeral head **ta dio** (the two) and its definite complement, a noun or adjective category, **ta podilata** (the bikes) and **ta kokina** (the red), respectively.

(80) a. dio podilata

        'two bikes'

    b. ta dio   ta podilata
       the two the bikes
       'the two bikes'

    c. ta dio   ta kokina
       the two the red
       'the two red ones'

The examples in (80) are instances of definite concord. Definite concord between numeral heads and their noun or adjective complements can be straightforwardly expressed by requiring that the UNIQUE value of a numeral and its subcategorized complement should be identical. This is illustrated in the AVM in (81), where the CONTENT | UNIQUE value of the numeral and the UNIQUE value inside its subcat list are identical $\boxed{1}$, by structure-sharing.

$$
(81) \quad \begin{bmatrix} CAT \mid SUBCAT \; < \; \begin{bmatrix} UNIQUE \; \boxed{1} \end{bmatrix} > \\ \\ CONT \mid UNIQUE \; \boxed{1} \end{bmatrix}
$$

Therefore, we guarantee that a UNIQUE− numeral such as **dio** (two), will combine with an indefinite noun or adjective category, e.g. **podilata** (bikes) or **kokina** (red), and vice versa, a UNIQUE+ numeral such as **ta dio** (the two) will take a UNIQUE+ NP or AP complement such as **ta podilata** (the bikes) or **ta kokina** (the red).

5.3   The distribution of determiners in definites and indefinites

In the previous sections (see in particular Section 3.2), we have seen that determiners in Greek may cooccur with noun, adjective, numeral and demonstrative projections. However, Greek determiners can be partitioned into two classes: (a) those that take definite complements (see (82a&b)), and (b) those that take indefinite complements (see (82c&d)).

(82) a. ola ta vivlia
      all *def* books
      'all the books'

    b. *ola vivlia
      all   books

    c. merika vivlia
      'some books'

    d. *merika ta vivlia
      some   *def* books

The account presented in Section 3.2 can be easily extended to cover the data in (82). Determiners like **ola** (all) can be taken to select for a UNIQUE+ complement. Such a requirement is lexically specified in their subcat list. The feature structure in (83) corresponds to the subcategorized complement of **ola**.

$$(83) \quad \begin{bmatrix} CAT \mid HEAD \ dem - nondem \\ \\ CONT \mid UNIQUE+ \end{bmatrix}$$

Thus, **ola** may only combine with definite DemPs, NPs, APs, or NumPs. Ill-formed examples such as (82b) above are excluded. On the other hand, determiners such as **merika** (some) require that their complement should be UNIQUE−. The element in their subcat list is as follows:

$$(84) \quad \begin{bmatrix} CAT \mid HEAD \ dem - nondem \\ \\ CONT \mid UNIQUE- \end{bmatrix}$$

Therefore, determiners of the latter kind will resist a definite complement. Notice, for instance, that **merika** may not cooccur with a demonstrative phrase, though such phrases are members of *dem-nondem*. As shown in Section 5.1 above, DemPs do not have a UNIQUE− counterpart, rather, they are invariably UNIQUE+. Then, ill-formed strings such as (85) below are ruled out.

(85)   *merika afta ta vivlia
        some   these the books
        '*some these books'

6   The Uniqueness Principle

Feature structures in HPSG are required to be *sort-resolved* (Carpenter 1992). A feature structure of sort σ is *sort-resolved* if the value of every feature defined for σ is maximal (most specific). For instance, the CASE value in a feature structure of sort *nominal* is maximal if it is an object of sort *nom*, *gen*, or *acc*, rather than *case* (since the latter sort is not atomic, rather it partitions into *nom*, *gen* and *acc*). The requirement for maximal specificity is directly related to the notion of underspecification in the HPSG framework. If the value of a given feature is underspecified, it means that it will be resolved in as many ways as the subsorts of the sort value appropriate for that feature. For example, if a nominal is underspecified for CASE, it will have three instantiations: a nominative, a genitive and an accusative one. In this section, I discuss a technical problem for the current approach that is related to the requirement for *sort resolved* feature structures.[23] In addition, I provide a solution to this problem by formulating the Uniqueness Principle and by slightly modifying the hierarchy of nominal sorts. Such modifications are not an organic part of the account proposed here, rather they enable us to deal with technical aspects of the grammatical theory (HPSG) that accommodates this account. In particular, they satisfy requirements imposed by the particular feature logic underlying HPSG in its current formulation and moreover the theory of adjuncts proposed in Pollard and Sag (1994). Hopefully, such extensions can be eliminated once HPSG is suitably modified.

In this work, indefinite adjectives are specified CONTENT | UNIQUE− and they select for a UNIQUE− noun category, through their head feature MOD. Viz.:

$$
(86) \quad \begin{bmatrix} MOD \mid CONT \mid UNIQUE- \\[1em] CONT \mid UNIQUE- \end{bmatrix}
$$

   Indefinite adjectives

Once the definite article syntactically combines with an indefinite adjective such as the one in (86), it yields a definite AP. However, the MOD value of such an AP is identical to that of its (indefinite) adjective daughter—the head-daughter—by the Head Feature Principle of HPSG. This is because MOD is a head feature. This is summarized in (87).

---

[23] The requirement for maximal specificity proves problematic for a number of accounts assuming the HPSG framework, e.g. an account of coordination in HPSG [Sag, p.c.]. See also the typed feature account of idioms in Copestake and Briscoe (1994), where *templates* are employed.

(87)

$$
\begin{array}{c}
\text{AP} \\
\left[\begin{array}{l}
\boxed{2}\ MOD\mid CONT\mid UNIQUE- \\
\boxed{1}\ CONT\mid UNIQUE+
\end{array}\right]
\end{array}
$$

adjunct   head

def   (indefinite) *adjective*

$\boxed{1}$ CONT | UNIQUE+ $\qquad \left[\begin{array}{l} \boxed{2}\ MOD\mid CONT\mid UNIQUE- \\ CONT\mid UNIQUE- \end{array}\right]$
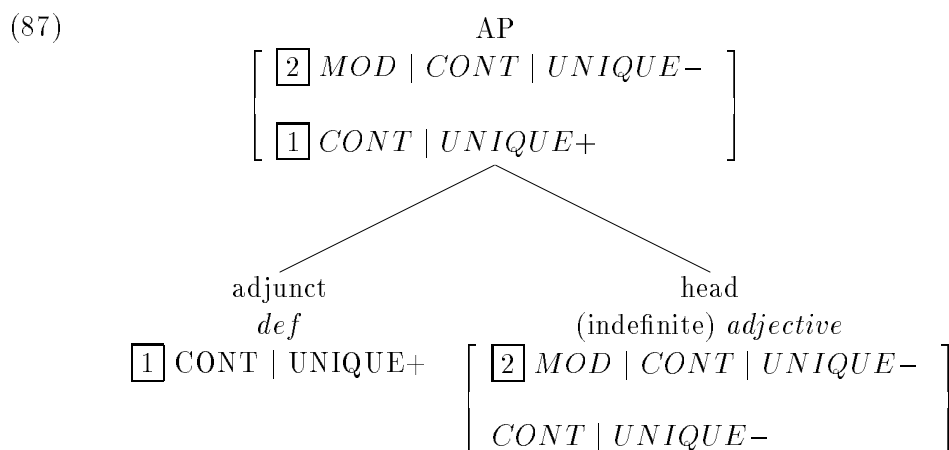
If *def* is allowed to cooccur with an indefinite adjective such as (86), a problem emerges: paradoxically, definite (UNIQUE+) adjectives will be allowed to select for indefinite (UNIQUE −) NPs. This is because incompatible values for the paths CONTENT | UNIQUE and MOD |...| UNIQUE propagate onto the mother from the adjunct-daughter (the definite article) and the head-daughter (the indefinite adjective), respectively. In a theory that places no requirement for maximal specificity, the MOD |...| UNIQUE value of an adjective category can be left underspecified and be required to unify with that of the CONTENT | UNIQUE path. Then, indefinite adjectives (i.e. adjectives specified CONTENT | UNIQUE−) will select for indefinite NPs (i.e. they will be specified MOD |...| UNIQUE−), whereas definite adjectives (i.e. adjectives specified CONTENT | UNIQUE+) will select for definite NPs (i.e. they will be specified MOD |...| UNIQUE+). However, HPSG does require that feature structures should be sort-resolved. In order to get round this problem, I introduce the Uniqueness Principle:

(88)   *The Uniqueness Principle:* In a head-adjunct-structure whose adjunct daughter is of sort *noun-adj-num* the CONT | UNIQUE value of the head-daughter is token-identical to the CONT | UNIQUE of the adjunct daughter.

$$
DTRS\ \left[\begin{array}{l}
HEAD-DTR\mid SYNSEM\mid CONT\mid UNIQUE\ \boxed{1} \\[2ex]
ADJ-DTR\mid SYNSEM\ \left[\begin{array}{l}
CAT\mid HEAD\ noun-adj-num\ [\ ] \\[2ex]
CONT\mid UNIQUE\ \boxed{1}
\end{array}\right]
\end{array}\right]
$$

The Uniqueness Principle requires that the UNIQUE value of an adjective or AP that is modifying a noun or NP should be identical to the UNIQUE value of the latter. Therefore, if the adjective category is UNIQUE−, the noun category should also be UNIQUE−, whereas if the AP is UNIQUE+, the NP should also be UNIQUE+. The Uniqueness Principle is a parochial principle, i.e. it exclusively applies to languages with definite concord phenomena like Greek. Notice that identity between the UNIQUE value of the adjunct daughter and the UNIQUE value of the head daughter is stipulated only in case the adjunct daughter is a member of the sort *noun-adj-num*. If, for instance, the adjunct daughter is of sort *def* (a

definite article), then no such identity will occur. The definite article that carries a UNIQUE+ specification is not subsumed under *noun-adj-num*. Therefore, it is allowed to cooccur with a UNIQUE− head (an NP, AP or NumP category).

In addition to the Uniqueness Principle, I assume two distinct types of indefinite adjectives. The sorts *adj1* and *adj2* differ from each other with respect to the value of the path: MOD | SYNSEM | LOCAL | CONTENT | UNIQUE. Viz.:
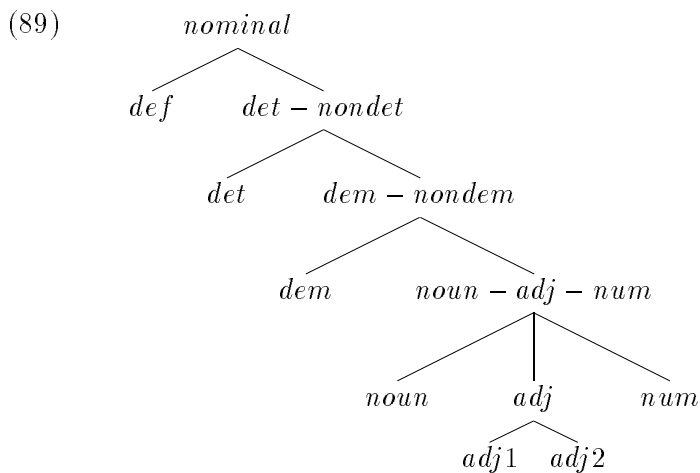
- *adj1*
$$\begin{bmatrix} MOD \mid CONT \mid UNIQUE+ \\ \\ CONT \mid UNIQUE- \end{bmatrix}$$

- *adj2*
$$\begin{bmatrix} MOD \mid CONT \mid UNIQUE- \\ \\ CONT \mid UNIQUE- \end{bmatrix}$$

(89) below provides an updated lattice for the hierarchy of nominal sorts in Greek.

(89)

Lattice for Greek nominal categories (with the two subsorts of **adj***)*

Once the definite article *def* syntactically combines with an adjective category of sort *adj1*, it yields a definite AP that in turn selects for a definite NP. This is illustrated in (90):

(90)

$$
\begin{array}{c}
\text{AP} \\
\left[
\begin{array}{l}
\boxed{2}\ MOD\mid CONT\mid UNIQUE+ \\[4pt]
\boxed{1}\ CONT\mid UNIQUE+
\end{array}
\right]
\end{array}
$$

$$
\begin{array}{cc}
def & adj1 \\
\boxed{1}\ \text{CONT}\mid\text{UNIQUE+} & \left[
\begin{array}{l}
\boxed{2}\ MOD\mid CONT\mid UNIQUE+ \\[4pt]
CONT\mid UNIQUE-
\end{array}
\right]
\end{array}
$$
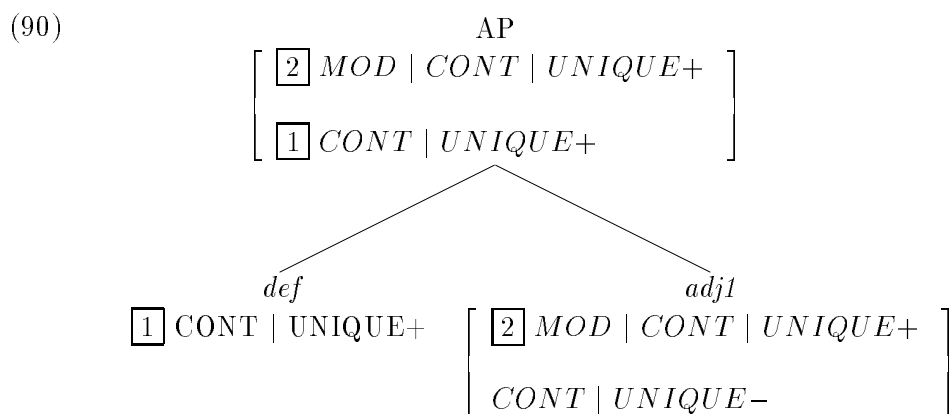
The top category in (90) will modify a definite NP, as required by the Uniqueness Principle. Viz.:

(91)

$$
\text{CONT}\mid\text{UNIQUE+}
$$

$$
\begin{array}{cc}
\text{AP} & \text{NP} \\
\left[
\begin{array}{l}
\boxed{2}\ MOD\mid CONT\mid UNIQUE+ \\[4pt]
\boxed{1}\ CONT\mid UNIQUE+
\end{array}
\right]
& \text{CONT}\mid\text{UNIQUE+}
\end{array}
$$
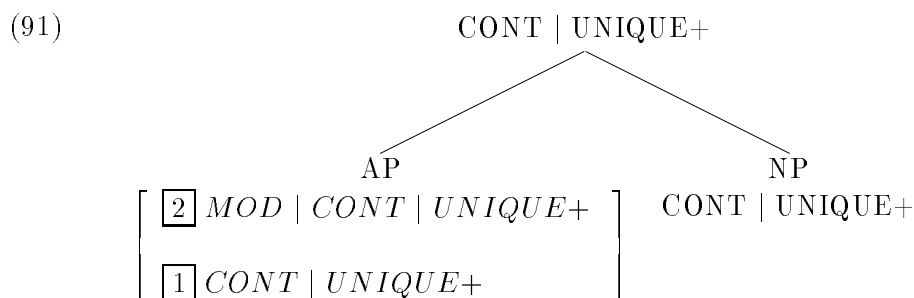
On the other hand, indefinite adjectives of sort *adj2* modify indefinite noun categories. Though nothing prevents the definite article from combining with an *adj2* adjective, a definite AP that is a projection of *adj2* cannot combine with an indefinite NP for the Uniqueness Principle would be violated. For the same reason, an indefinite adjective of sort *adj1* can never combine with a definite NP.[24]

In this section, I have formulated the Uniqueness Principle and introduced a further partition in the hierarchy of nominal sorts for Greek. These modifications enable us to preserve current assumptions of the HPSG theory concerning the analysis of adjuncts and moreover completeness criteria that feature structures are required to satisfy. However, none of these additions should be considered to be an organic part of the approach to definiteness and the make-up of nominals that has been proposed in this chapter. Rather, they can be abolished, in favour of further simplification of linguistic theory, provided the HPSG theory of adjuncts and underlying feature logic are suitably modified.

---

[24] A modification similar to the one I have provided in this section for adjectives is also required for numerals, so as to make sure that the CONTENT | UNIQUE value of a numeral and the one of its subcategorized complement inside its subcat list are identical.

7   Conclusions and suggestions for further research

In this paper, I have presented an account of the nominal system in Greek couched in the framework of HPSG. Two main components of this work clearly bear on cross-linguistic research on NPs and moreover other areas of linguistic theory such as a general theory of elliptical interpretation. In particular, I have developed an approach to definiteness that enables us to account for definite concord phenomena. Such phenomena are not idiosyncratic to Greek but rather characterize a wide range of languages, e.g. Scandinavian (Swedish and Norwegian) Balkan and Semitic (Hebrew and Arabic). In addition, I provided an account of the unifying properties of nominal categories based on inheritance. From this cross-classification of nominal sorts emerges a straightforward account of the syntax of nominal ellipsis, without positing linguistic constructs that are lacking independent motivation, such as, for instance, empty constituents.

An intriguing goal for further research is to parametrize the current approach to definiteness and definite concord in order to account for languages other than Greek. More specifically, it is worth exploring issues such as the following:

- The types of marker of definiteness across languages, i.e., whether they are words or bound morphemes, with special attention to Scandinavian that makes use of both definite articles and suffixes,

- The types of hosts that definite markers attach on: those can be either phrases or words in languages like Greek, or they are strictly lexical, as in Hebrew, etc.

- A further issue is the co-occurrence or complementary distribution of demonstratives and definite markers, in particular in languages like Romanian where both options are available and they affect word order.

- Finally, it is interesting to explore how to parametrize the overall system and thus account for determiner-centric languages with no definite concord (e.g. English).

Another important direction for further research is to generalize the approach to elliptical nominals presented here, in order to cover other instances of ellipsis and in particular "phrasal" ellipsis in dialogue. Dialogue favours highly elliptical speech. At the same time, it motivates a minimalist approach to the syntax of ellipsis. The question Bill? uttered for clarification after a statement such as Bill is annoying. could be taken to mean Who is Bill? or Which Bill are you talking about? or even Are you saying that Bill of all people is annoying? etc. Then, Bill? is not really "elliptical", in the sense that it appears to lack a unique, fully spelled-out counterpart. A theory of phrasal ellipsis needs to account for the fact that fragments of any syntactic category (e.g. Bill or is annoying are licit as sentential level utterances in dialogue. On the syntactic front, such cases are particularly hard to analyze using empty constituents because of the difficulty of providing a restrictive theory governing the distribution of such elements.

It will be important to integrate this approach to ellipsis with work that explores the addition of packaging information into HPSG (cf. Engdahl and Vallduví 1994).

Acknowledgments

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5

An HPSG Account of the Korean Honorification System

Dong-Young Lee

Abstract

The Korean honorification system consists of three types of honorification: subject honorification, object honorification, and addressee honorification. If a subject referent or an object referent is the inalienable part of an individual who is honored by the speaker, the referent is also honored by the speaker. In all three types of honorification the sentence-external individuals such as speaker and addressee play an important role. The information about relative social status of the individuals involved in a sentence provides the context where the sentence can be felicitous. Since it is possible to incorporate the sentence-external individuals and the contextual information about social status in the HPSG formalism, that formalism is adopted here. This paper presents a new way of analyzing the Korean honorification system and shows how this new approach overcomes the shortcomings arising from previous accounts, which do not consider the role of addressee and relative social status.

1   Introduction

The system of honorification is an outstanding characteristic of the Korean language. In the system the following individuals are involved: speaker, addressee, the referent of the subject, and the referent of the object (if any). These individuals except for the speaker of a sentence may be respected. This is due to the fact that in Korean society it is a virtue to humble oneself. Thus, the honorification system can be divided into the three patterns: subject honorification, object honorification,[1] and addressee honorification.[2] The occurrence of a certain type of honorification is constrained by the relative order in social status among the four individuals mentioned above. Factors such as kinship, age, and social rank play an important role in deciding relative social status.

Every sentence has a verb. We can tell from a verb whether subject honorification and addressee honorification occur in a sentence. If a suppletive humble form of the verb appearing in a sentence is available, we can additionally know whether object honorification occurs in the sentence. Thus when looking at a sentence, we must consider the three types of honorification simultaneously. In previous works (Suh 1978, Kuno and Kim 1985, Kim 1988, Pollard and Sag 1994) attention was paid only to subject honorification and it was treated as a kind of agreement. This previous approach has limitations and thus cannot be applied to the explanation of other types of honorification, especially addressee honorification. Object honorification is indicated only in the object NP when suppletive humble form is not available and addressee honorification is manifested only in the verbal ending. In these cases the agreement account is not valid. The system of Korean honorification has a complex and dynamic structure based on the relative order in social status among speaker, addressee, the referent of the subject, and the referent of the object. Since the information about the social status of these people is not included in the previous approach, the context where a sentence is felicitous cannot be provided.

This paper aims to explain the Korean honorification system within the framework of head-driven phrase structure grammar (HPSG) developed by Pollard and Sag (1994). The contextual information about relative social status of the individuals involved in a sentence is essential to the explanation of the honorification system in Korean. The reason why the HPSG formalism is adopted here is that it is possible to incorporate this contextual information in the lexical sign or phrasal sign within the formalism. This paper overcomes the shortcomings arising from the previous approach by considering the three types of honorification at the same time, by including the background information about relative social status, and by treating the honorification phenomenon as a phenomenon related to the compatibility of this background information, not as a kind of agreement.

The data of subject honorification, object honorification, or addressee honorification and the role of honorific morphemes are presented in Section 2. In order for a certain type of honorification to occur the constraint on social status should be satisfied. Section 3 deals with this constraint. In Section 4, after reviewing earlier approaches to subject honorification,

---

[1] Subject honorification and object honorification are called referent honorification in Cho (1982). While in subject honorification honorific agreement occurs between the subject NP and the verb, in object honorification honorific agreement occurs between the object NP and the verb only when the verb has a humble form. Thus it is necessary to distinguish these two types of honorification.

[2] Instead of the term 'addressee honorification' the term 'speech level' is used in Martin and Lee (1969). The term 'addressee honorification' is adopted here to clarify the entity which is honored.

we analyze the Korean honorification system and explain the felicity or infelicity of a sentence by a new approach, that is, by considering the three types of honorification simultaneously and using the background information about relative social status. Section 5 shows that the honorification phenomenon can also occur in the construction containing other verbs besides a main verb. Finally, Section 6 discusses the advantages of the new approach while emphasizing the importance of the role of the sentence-external individuals and the background information about relative social status in the analysis of the honorification system.

2   Linguistic Data

The occurrence of honorification in a sentence is manifested by the following linguistic elements: the honorific case marker, the honorific suffix *nim*, the honorific form of a noun, the honorific infix *si*, the honorific verbal ending, and the humble verb form. The interaction between these linguistic elements gives rise to the appropriate type of honorification. Since the speaker is the utterer of a sentence, it is the speaker who shows respect to others using relevant linguistic elements in a sentence.[3]

Subject honorification occurs when the individual referred to by the subject of a sentence is honored by the speaker as shown in (1).[4]

(1)　　John-uy apeci-kkeyse　　mayil　　sanchaykha-si-e.
　　　　　gen father-nom (hon) every day take a walk-hon-dec

　　　　'John's father takes a walk every day.'

In sentence (1), the speaker shows honor to the subject referent by using the nominative honorific case marker *kkeyse* and the honorific infix *si*. The speaker and the addressee may be friends. To the contrary, the sentence shown in (2) is not felicitous.[5]

(2)　　#John-uy apeci-kkeyse　　mayil　　sanchaykha-n-ta.
　　　　　gen father-nom (hon) every day take a walk-pres-dec

　　　　'John's father takes a walk every day.'

---

[3] If the subject referent and the speaker refer to the same person and the social status of the addressee is higher than that of the speaker, the humble form of the first-person singular pronoun, i.e., *cey*, is used instead of the nonhumble form *nay*, as shown in (a).

(a)　　cey-ka　　　　ku saken-ul　　mokkyekha-yess-eyo.
　　　　I (hum)-nom the accident-acc witness-past-dec (hon)

　　　　'I witnessed the accident.'

[4] The abbreviations used in the glosses are as follows:

nom: nominative case marker	gen: genitive case marker
dat: dative case marker	acc: accusative case marker
pres: present tense	past: past tense
hon: honorific marker or honorific form	hum: humble form
comp: complementizer	postp: postposition
dec: declarative ending	int: interrogative ending

[5] In order for a sentence to be felicitous, the sentence must be grammatical in the syntactic aspect and must be used in an appropriate context.

An inalienable part of the honored subject referent can also be respected as illustrated in sentence (3).

(3)   ku pwun-uy   son-i   cham potulawu-si-e.
        the man (hon)-gen hand-nom very   soft-hon-dec
        'The man's hands are very soft.'

Inalienable parts include both the entity which is physically inalienable from the possessor (i.e., body parts such as eyes, hands, and feet) and the entity that is mentally inalienable from the possessor (that is, thought and hometown).

Just as subject honorification occurs when the subject referent is honored by the speaker, so object honorification occurs when the object referent is honored by the speaker. There are two ways to show object honorification. One way is just to attach the honorific suffix *nim* or an honorific case marker to the object NP if the verb describing the action of the subject referent does not have a suppletive humble form. The other way is to attach the honorific suffix *nim* or an honorific case marker to the object NP and to use a suppletive humble form of a verb.

(4) a.   tongsayng-i   kyocang sensayng-nim-ul cohaha-ni?
            younger brother-nom principal teacher-hon-acc like-int

            'Does my younger brother like his principal?'

     b.   tongsayng-i   sensayng-nim-kkey   chayk-ul tuli-ess-e.
            younger brother-nom teacher-hon-dat (hon) book-acc give (hum)-past-dec

            'My younger brother gave a book to his teacher.'

     c.   tongsayng-i   chinkwu-eykey chayk-ul cwu-ess-e.
            younger brother-nom friend-dat   book-acc give-past-dec

            'My younger brother gave a book to his friend.'

Since the verb *cohaha* in (4a) does not have a humble form, just the honorific suffix *nim* is used to show object honorification. The verb *tuli* in (4b) is the humble form of the verb *cwu* in (4c). In (4b) object honorification occurs as in (4a), whereas in (4c) object honorification does not occur.

In accordance with the relationship and the difference in social status between the speaker and the addressee a different verbal ending is used. The formal verbal ending or the informal one indicates the relationship between the speaker and the addressee. For example, when the speaker talks to the addressee, who is his friend, the informal verbal ending is used, whereas when the speaker talks to the addressee, who meets the speaker for business, the formal verbal ending is used. The inventory of verbal endings is as illustrated in (5).

(5)   a.   The Declarative Ending[6]

	Honorific	Nonhonorific
Formal	(su)pnita	ta
Informal	((y)e)yo	e, a

　　　b.   The Interrogative Ending[7]

	Honorific	Nonhonorific
Formal	(su)pnikka	(nu)nka
Informal	((y)e)yo	ni, e, a

　　　c.   The Imperative Ending[8]

	Honorific	Nonhonorific
Formal	sipsio	(e)la
Informal	(u)seyyo	e, a

　　　d.   The Propositive Ending[9]

	Honorific	Nonhonorific
Formal	sipsita	ca
Informal	siciyo	e, a

When the speaker shows honor or courtesy to the addressee, the honorific verbal ending is used as shown in sentence (6).

(6)   Minsoo-ka mayil   sanchaykha-yeyo.
　　　　　　nom every day take a walk-dec (hon)

　　　'Minsoo takes a walk every day.'

Although it is true that when the social status of the addressee is higher than that of the speaker, the honorific verbal ending is used, it is not always true that if the honorific verbal ending is used, the social status of the addressee is higher than that of the speaker. The reason is that the honorific verbal ending is also used when the speaker shows courtesy to the addressee, whose social status is lower than that of the speaker. Thus we can infer that the social status of the speaker is not equal to that of the addressee when the honorific verbal ending is used in a sentence. On the other hand, when the nonhonorific verbal ending is used, the social status of the speaker is equal to or higher than that of the addressee.

---

[6] The notation '((y)e)yo' means that it can be realized as *yo, eyo,* or *yeyo.* This applies to the notation of other verbal endings.

[7] The marker *((y)e)yo, e* or *a* has a falling intonation when it is used as the declarative ending, whereas it has a rising intonation when it is used as the interrogative ending.

[8] The marker *e* or *a* has a falling intonation with a strong accent when it is used as the imperative ending.

[9] In this case the marker *e* or *a* is pronounced with a softer tone and a little longer duration than in other cases.

3 Constraint of Social Status on the Occurrence of Honorific-ation

In order for subject honorification to occur, the social status of the subject referent should be higher than that of the speaker and that of the addressee. This constraint can be represented as in (7).[10]

(7) $\mathrm{Ref}_s > \mathrm{Ref}_{sp}$,
         $\mathrm{Ref}_s > \mathrm{Ref}_{ad}$

Pollard and Sag (1994: 93) say that the occurrence of subject honorification is sometimes dictated by the social relation of the speaker to the subject referent, but is sometimes dictated by the social relation of the addressee to the subject referent. This is not correct. The reason is that in order for subject honorification to occur the social status of the subject referent must be higher than that of both the speaker and the addressee. In other words, if the social status of the subject referent is higher than that of the speaker, but is not higher than that of the addressee, subject honorification does not occur. Thus as shown in (7) both the social relation of the subject referent to the speaker (that is, $\mathrm{Ref}_s > \mathrm{Ref}_{sp}$) and the social relation of the subject referent to the addressee (i.e., $\mathrm{Ref}_s > \mathrm{Ref}_{ad}$) are always required for the occurrence of subject honorification. On the other hand, if the subject referent is not honored by the speaker, the social status of the speaker is equal to or higher than that of the subject referent as illustrated in (8).

(8) $\mathrm{Ref}_{sp} \geq \mathrm{Ref}_s$

Likewise, in order for object honorification to occur the social status of the object referent should be higher than that of the speaker and that of the addressee as shown in (9).

(9) $\mathrm{Ref}_o > \mathrm{Ref}_{sp}$,
         $\mathrm{Ref}_o > \mathrm{Ref}_{ad}$

If a suppletive humble form of a verb is used in a sentence, both the constraint in (9) and the constraint in (10) should be satisfied.

(10) $\mathrm{Ref}_o > \mathrm{Ref}_s$

When object honorification does not occur, the social status of the speaker is equal to or higher than that of the object referent as shown in (11).

(11) $\mathrm{Ref}_{sp} \geq \mathrm{Ref}_o$

Finally, if an honorific verbal ending is used in a sentence, the social status of the speaker is not equal to that of the addressee as illustrated in (12).

---

[10] In the notations adopted here Ref_s and Ref_o are used to indicate the subject referent and the object referent, respectively, whereas Ref_{sp} and Ref_{ad} are used to indicate the speaker and the addressee, respectively.

(12) $\mathrm{Ref}_{sp} \neq \mathrm{Ref}_{ad}$

Since an honorific verbal ending can be used for showing honor or courtesy to the addressee, we cannot simply infer that the social status of the addressee is higher than that of the speaker from the appearance of an honorific verbal ending in a sentence. On the other hand, when a plain verbal ending is used, the social status of the speaker is equal to or higher than that of the addressee as shown in (13).

(13) $\mathrm{Ref}_{sp} \geq \mathrm{Ref}_{ad}$

4   Analysis of the Korean Honorification System

To determine whether a sentence is felicitous in a certain context, the information about the social status of the individuals involved in the sentence should be available and all types of honorification relevant to the sentence must be considered at the same time.

4.1   Previous Analyses

Suh (1978), Kuno and Kim (1985), and Kim (1988) describe the phenomenon of subject honorification as syntactic agreement, excluding the role of the speaker and the addressee. Let us consider the examples in (14).

(14) a.   Mary-uy emeni-kkeyse   ku moim-ey   chamsekha-si-ess-e.
                  gen mother-nom (hon) the meeting-at attend-hon-past-dec

         'Mary's mother attended the meeting.'

    b.   Mary-uy emeni-ka   ku moim-ey   chamsekha-yess-e.
                  gen mother-nom the meeting-at attend-past-dec

         'Mary's mother attended the meeting.'

According to the syntactic agreement account the sentences in (14) are grammatical because syntactic agreement occurs between a subject NP and its corresponding verb. In other words, when a subject NP has an honorific marker, the verb should also have an honorific marker as in (14a), whereas if a subject NP has no honorific marker, the verb must not have an honorific marker as in (14b). Honorification appears when someone makes an utterance to somebody else. Honorification requires not just the syntactic grammaticality of a sentence, but also the relevant use of the sentence in an appropriate context. Since this syntactic agreement account neither considers sentence-external individuals such as the speaker and the addressee nor includes the background information about social status, it cannot explain that a sentence can be felicitous only in a restricted context and that the context where sentence (14a) is felicitous is different from the context in which sentence (14b) is felicitous though these sentences are both grammatical.

Pollard and Sag (1994: 92–95) briefly deal with subject honorification, including information about the speaker. They describe subject honorification as pragmatic agreement, not as

syntactic agreement. According to this account the sentences in (14) are felicitous since the background information from the subject NP agrees with the background information from the verb. Although this pragmatic agreement account is better than the syntactic agreement account, it is not enough. Since this account pays attention to subject honorification, it is not complete and has limitations. First, every sentence contains a verb. Addressee honorification as well as subject honorification is indicated in the verb.[11] Addressee honorification also has an effect on the felicity of a sentence. Thus when looking at a sentence, it makes sense to consider at least both subject honorification and addressee honorification. Second, the information about the social status of the individuals involved in a sentence should be added to the background information. For example, when the social status of the speaker is higher than that of the subject referent, only the sentence in (14b) is felicitous. The pragmatic agreement account, however, misjudges that both (14a) and (14b) are felicitous. Third, in the case of addressee honorification the background information that the speaker honors the addressee is provided only by the verbal ending. In addition, in the case of object honorification the background information that the speaker honors the object referent is supplied only by the object NP if a suppletive humble form of a verb is not available. Thus in these cases the pragmatic agreement account is not valid.

4.2   New Analysis

In HPSG the information about the speaker and the addressee of a sentence can be included in the attribute C-INDICES. Furthermore, the information about the social status of the individuals involved in a sentence can be incorporated in the attribute BACKGROUND. Pollard and Sag (1994: 94) specify only SPEAKER as the value of the attribute C-INDICES and use *owe-honor* as the value of RELATION. To account for the honorification system correctly the attribute ADDRESSEE should be included in the attribute C-INDICES and it is more appropriate to use *show-honor* as the value of RELATION. The reason is that a speaker and an addressee are involved in every sentence and there are situations in which the speaker cannot show honor to a referent even though honor is owed to that referent. For example, in the case where the social status of a subject referent is higher than that of the speaker, but is not higher than that of the addressee, the speaker cannot show honor to the subject referent (that is, subject honorification does not occur) though the former owes honor to the latter. In addition, the information about social status should also be included in the attribute BACKGROUND since social status plays an important role in the Korean honorification system. Under this modification let us now explain the felicity of a sentence in a given context.

4.2.1   Occurrence of Subject Honorification

Let us first consider sentence (1), repeated here, in which subject honorification occurs, but addressee honorification does not occur.

(1)   John-uy apeci-kkeyse   mayil   sanchaykha-si-e.
            gen father-nom (hon) every day take a walk-hon-dec

        'John's father takes a walk every day.'

---

[11] If a humble verb form is used in a sentence, all three types of honorification are indicated in the verb.

The speaker of sentence (1) can also utter the sentences in (15) to show honor to the subject referent:

(15) a.   John-uy apenim-i   mayil   sanchaykha-si-e.
             gen father (hon)-nom every day take a walk-hon-dec

      'John's father takes a walk every day.'
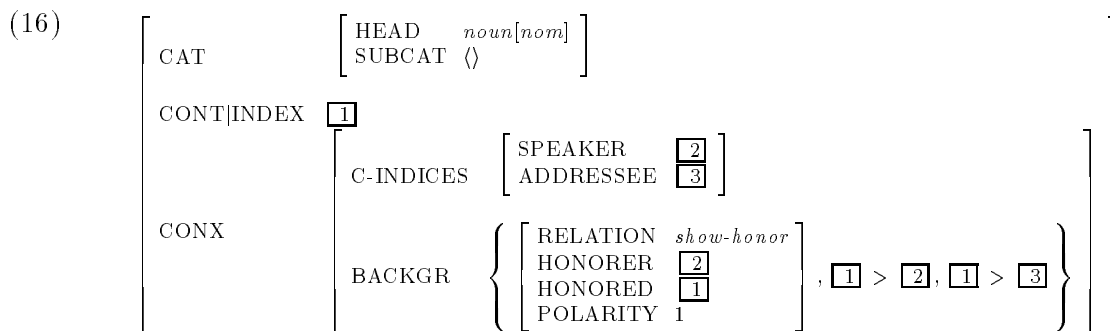
      b.   John-uy apenim-kkeyse   mayil   sanchaykha-si-e.
             gen father (hon)-nom (hon) every day take a walk-hon-dec

      'John's father takes a walk every day.'

In sentence (1) the honorific nominative case marker *kkeyse* attaches to the subject NP *John-uy apeci*. In (15a) the noun *apenim* which is the honorific form of the noun *apeci* is used and in (15b) both the honorific form *apenim* and the honorific nominative case marker *kkeyse* are used. It is assumed here that the honorific morphemes such as the honorific nominative case marker *kkeyse* and the honorific suffix *nim* introduce into the attribute BACKGROUND the psoa (parameterized state of affairs) that the speaker shows honor to the referent of the NP to which these honorific morphemes attach. It is also assumed that the honorific form of a noun introduces into the attribute BACKGROUND the psoa that the speaker shows honor to the referent of the NP that contains the noun. If neither the honorific suffix *nim* nor the honorific nominative case marker *kkeyse* attaches to a subject NP and an honorific form of a noun is not used in the subject NP, it means that the speaker does not honor the subject referent. Under these assumptions the LOCAL values for *John-uy apeci-kkeyse*, *John-uy apenim-i*, and *John-uy apenim-kkeyse* will all be the same as the one shown in (16).[12]

(16)
$$
\left[
\begin{array}{ll}
\text{CAT} & \left[\begin{array}{ll}\text{HEAD} & noun[nom] \\ \text{SUBCAT} & \langle\rangle\end{array}\right] \\[2ex]
\text{CONT|INDEX} & \boxed{1} \\[2ex]
\text{CONX} & \left[\begin{array}{ll}
\text{C-INDICES} & \left[\begin{array}{ll}\text{SPEAKER} & \boxed{2} \\ \text{ADDRESSEE} & \boxed{3}\end{array}\right] \\[3ex]
\text{BACKGR} & \left\{\left[\begin{array}{ll}\text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{2} \\ \text{HONORED} & \boxed{1} \\ \text{POLARITY} & 1\end{array}\right], \boxed{1} > \boxed{2}, \boxed{1} > \boxed{3}\right\}
\end{array}\right]
\end{array}
\right]
$$

The notations $\boxed{1} > \boxed{2}$ and $\boxed{1} > \boxed{3}$ in (16) represent the diagrams in (17a) and (17b), respectively.

(17)   a.
$$
\left[\begin{array}{ll}
\text{RELATION} & higher\text{-}s\text{-}status \\
\text{HIGHER} & \boxed{1} \\
\text{LOWER} & \boxed{2} \\
\text{POLARITY} & 1
\end{array}\right]
$$

---

[12] The following abbreviations are used in the attribute and value names:

CAT: CATEGORY   C-INDICES: CONTEXTUAL INDICES
CONT: CONTENT   BACKGR: BACKGROUND
CONX: CONTEXT   *higher-s-status: higher social status*

b. $\begin{bmatrix} \text{RELATION} & \textit{higher-s-status} \\ \text{HIGHER} & \boxed{1} \\ \text{LOWER} & \boxed{3} \\ \text{POLARITY} & 1 \end{bmatrix}$

The value for the attribute POLARITY is either 1 or 0. When the value is 1, the information about the given relation is true, whereas when the value is 0, the information about the given relation is false. For example, in the AVM (attribute-value matrix) diagram illustrated in (16) the information that the speaker honors the subject referent is true. The diagram shown in (16) describes the LOCAL value for the subject NP combined with a nominative case marker.[13] If the background psoa for just the subject NP, excluding a nominative case marker, is taken into consideration, there is no way to explain that subject honorification occurs in sentence (1). The diagram in (17a) shows that the social status of the subject referent is higher than that of the speaker and the diagram in (17b) shows that the social status of the subject referent is also higher than that of the addressee.

The honorific infix *si* introduces into the attribute BACKGROUND the psoa that the speaker shows honor to the referent of the subject. The absence of the honorific infix *si* in a verb indicates that the speaker does not honor the subject referent. Whether the speaker respects the addressee or not is indicated by the verbal ending. The declarative ending *e* appearing in sentences (1), (15a), and (15b) is used when the social status of the speaker is equal to or higher than that of the addressee and the relationship between these two discourse participants is informal. Because the verbal ending indicates the relative order in social status and the relationship between the speaker and the addressee, the attribute FORMAL is added to the pool of the background information. If the relationship is formal, the value for the attribute FORMAL is 1. If the relationship is informal, the value for the attribute FORMAL is 0. Thus the LOCAL value for the verb *sanchaykha-si-e* which appears in (1), (15a), and (15b) is as illustrated in (18).[14]

(18) $\begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{verb}[\textit{fin,dec}] \\ \text{SUBCAT} & \langle \text{NP}[\textit{nom}]_{\boxed{1}} \rangle \end{bmatrix} \\[2em] \text{CONT} & \begin{bmatrix} \text{RELATION} & \textit{take-a-walk} \\ \text{TAKE-A-WALKER} & \boxed{1} \end{bmatrix} \\[2em] \text{CONX} & \begin{bmatrix} \text{C-INDICES} & \begin{bmatrix} \text{SPEAKER} & \boxed{2} \\ \text{ADDRESSEE} & \boxed{3} \end{bmatrix} \\[2em] \text{BACKGR} & \left\{ \begin{bmatrix} \text{RELATION} & \textit{show-honor} \\ \text{HONORER} & \boxed{2} \\ \text{HONORED} & \boxed{1} \\ \text{POLARITY} & 1 \end{bmatrix}, \begin{bmatrix} \text{RELATION} & \textit{show-honor} \\ \text{HONORER} & \boxed{2} \\ \text{HONORED} & \boxed{3} \\ \text{POLARITY} & 0 \\ \text{FORMAL} & 0 \end{bmatrix}, \right\} \\ & \boxed{1} > \boxed{2}, \boxed{1} > \boxed{3}, \qquad \boxed{2} \geq \boxed{3} \end{bmatrix} \end{bmatrix}$

The notation $\boxed{2} \geq \boxed{3}$ in (18) stands for the diagram in (19).

---

[13]In the case of *apenim-kkeyse*, the honorific form of a noun and the honorific case marker introduce into BACKGROUND the same psoa that the speaker shows respect to the referent of the subject NP.

[14]In the diagram '*verb*[*fin,dec*]' means that VERB-INFLECTIONAL-FORM is finite and ENDING-FORM is declarative.

(19)
$$
\begin{bmatrix}
\text{RELATION} & equal\text{-}higher\text{-}s\text{-}status \\
\text{EQUAL-HIGHER} & \boxed{2} \\
\text{EQUAL-LOWER} & \boxed{3} \\
\text{POLARITY} & 1
\end{bmatrix}
$$

Compared with the background condition shown in (16), the background condition specified by the verb *sanchaykha-si-e* has the additional information that the speaker does not show honor to the addressee and the relationship between them is not formal. Although the background condition provided by the verb is more informative than that supplied by the subject referent combined with the nominative marker, there is no conflict in these background conditions. Consequently, the three sentences (1), (15a), and (15b) contain no inconsistency in the background conditions and thus are felicitous in the context where the social status of the addressee is not higher than that of the speaker and the subject referent has higher social status than both the speaker and the addressee. The sketchy analysis of subject honorification given in Pollard and Sag (1994) does not include the information about the social status of individuals involved in a sentence and thus the context in which a sentence is felicitous cannot be specified.

Let us now turn to the sentence in (2) and consider why it is not felicitous.

(2)   # John-uy apeci-kkeyse   mayil   sanchaykha-n-ta.
          gen father-nom (hon) every day take a walk-pres-dec

       'John's father takes a walk every day.'

The LOCAL value for the subject NP together with the nominative marker is the same as the AVM diagram illustrated in (16). On the other hand, the LOCAL value for the verb *sanchaykha-n-ta* is as shown in (20).

(20)
$$
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \text{HEAD} & verb[fin, dec] \\ \text{SUBCAT} & \langle \text{NP}[nom]_{\boxed{1}} \rangle \end{bmatrix} \\[2ex]
\text{CONT} & \begin{bmatrix} \text{RELATION} & take\text{-}a\text{-}walk \\ \text{TAKE-A-WALKER} & \boxed{1} \end{bmatrix} \\[2ex]
\text{CONX} & \begin{bmatrix}
\text{C-INDICES} & \begin{bmatrix} \text{SPEAKER} & \boxed{2} \\ \text{ADDRESSEE} & \boxed{3} \end{bmatrix} \\[2ex]
\text{BACKGR} & \left\{ \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{2} \\ \text{HONORED} & \boxed{1} \\ \text{POLARITY} & 0 \end{bmatrix}, \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{2} \\ \text{HONORED} & \boxed{3} \\ \text{POLARITY} & 0 \\ \text{FORMAL} & 1 \end{bmatrix}, \right\} \\
& \boxed{2} \geq \boxed{1}, \qquad\qquad\qquad \boxed{2} \geq \boxed{3}
\end{bmatrix}
\end{bmatrix}
$$

Since the verb *sanchaykha-n-ta* lacks the honorific infix *si*, that verb provides a negative condition (that is, [POLARITY 0]) for the background information about the *show-honor* relation between the speaker and the subject referent. The declarative ending *ta* is used when the social status of the speaker is equal to or higher than that of the addressee and the relationship between them is formal. Thus the verb *sanchaykha-n-ta* also provides a negative condition

for the background information about the *show-honor* relation between the speaker and the addressee.

A closer look at the AVM diagrams in (16) and (20) shows that the background condition for the phrase *John-uy apeci-kkeyse* contains the attribute-value pair [POLARITY 1] for the information about the *show-honor* relation between the speaker and the subject referent, whereas the background condition for the verb *sanchaykha-n-ta* contains the attribute-value pair [POLARITY 0] for the same information. These two attribute-value pairs cannot be unified and thus the two background conditions cannot be unified, either.[15] Accordingly, the sentence in (2) contains inconsistency in the background condition and thus is infelicitous. In other words, in order for sentence (2) to be felicitous there should be a context where the social status of the subject referent is higher than that of the speaker and the social status of the same subject referent is equal to or lower than that of the same speaker. Such a context, however, does not exist. Thus sentence (2) cannot be felicitous.

Let us turn to the sentence in (3) and explain why it is felicitous.

(3)   ku pwun-uy   son-i   cham potulawu-si-e.
        the man (hon)-gen hand-nom very   soft-hon-dec

        'The man's hands are very soft.'

In the context where sentence (3) is uttered, the sentence in (21) is not felicitous.

(21)   #ku salam-uy son-i   cham potulawu-si-e.
        the man-gen hand-nom very   soft-hon-dec

        'The man's hands are very soft.'

The noun *pwun* in (3) is the honorific form of the noun *salam* in (21). So, it is assumed that if the possessor of the subject referent is honored by the speaker and the subject referent is the inalienable part of the honored possessor, then the referent of the subject is also honored. This fact is captured by the principle of honor copying stated in (22).

(22)   Honor Copying Principle
        If an individual mentioned in a sentence is honored by the speaker, the inalienable
        part of the individual is also honored by the speaker

The above principle can be represented as in (23).

---

[15] The background information about the *show-honor* relation between the speaker and the addressee does not conflict with the background information supplied by *John-uy apeci-kkeyse*. The reason is that only the information about the *show-honor* relation between the speaker and the referent of the subject is specified in the background information provided by *John-uy apeci-kkeyse*.

(23)

$$
\begin{bmatrix} \text{RELATION} & \textit{show-honor} \\ \text{HONORER} & \boxed{1} \\ \text{HONORED} & \boxed{2} \\ \text{POLARITY} & 1 \end{bmatrix}
$$

$$\Diamond$$

$$
\begin{bmatrix} \text{RELATION} & \textit{inalienable-poss} \\ \text{POSSESSOR} & \boxed{2} \\ \text{POSSESSED} & \boxed{3} \\ \text{POLARITY} & 1 \end{bmatrix}
$$

$$\longrightarrow$$

$$
\begin{bmatrix} \text{RELATION} & \textit{show-honor} \\ \text{HONORER} & \boxed{1} \\ \text{HONORED} & \boxed{3} \\ \text{POLARITY} & 1 \end{bmatrix}
$$

In (23) the symbol '$\Diamond$' is used to indicate that the upper left diagram appears together with the lower left diagram in a lexical sign and the symbol '$\longrightarrow$' is used to indicate that as a result of this co-appearance, the right-hand diagram is obtained from the upper left diagram. Thus the LOCAL and QSTORE value for *ku pwun-uy son-i* is as illustrated in (24) after the principle of honor copying is applied.[16]

(24)

$$
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{noun[nom]} \\ \text{SUBCAT} & \langle\rangle \end{bmatrix} \\[2em]
\text{CONT} & \begin{bmatrix} \text{INDEX} & \boxed{1} \\ \text{RESTR} & \left\{ \begin{bmatrix} \text{RELN} & \textit{hands} \\ \text{INST} & \boxed{1} \end{bmatrix} \right\} \end{bmatrix} \\[2em]
\text{CONX} & \begin{bmatrix} \text{C-INDICES} & \begin{bmatrix} \text{SPEAKER} & \boxed{3} \\ \text{ADDRESSEE} & \boxed{4} \end{bmatrix} \\[2em] \text{BACKGR} & \left\{ \begin{bmatrix} \text{RELATION} & \textit{show-honor} \\ \text{HONORER} & \boxed{3} \\ \text{HONORED} & \boxed{1} \\ \text{POLARITY} & 1 \end{bmatrix}, \right\} \\ & \boxed{2} > \boxed{3}, \boxed{2} > \boxed{4} \end{bmatrix}
\end{bmatrix}
$$

$$
\text{QSTORE:} \quad \left\{ \begin{bmatrix} \text{DET} & \textit{the} \\ \text{RESTIND} & \begin{bmatrix} \text{INDEX} & \boxed{1} \\ \text{RESTR} & \left\{ \begin{bmatrix} \text{RELN} & \textit{hands} \\ \text{INST} & \boxed{1} \end{bmatrix}, \begin{bmatrix} \text{RELATION} & \textit{inalienable-poss} \\ \text{POSSESSOR} & \boxed{2} \\ \text{POSSESSED} & \boxed{1} \\ \text{POLARITY} & 1 \end{bmatrix} \right\} \end{bmatrix} \end{bmatrix} \right\}
$$

In AVM diagram (24) $\boxed{2}$ is the index introduced by *ku pwun* 'the man'. Thus diagram (24) shows that when the referent of the subject is an inalienable part of the possessor and the possessor has higher social status than both the speaker and the addressee, the inalienable part is honored by the speaker.

---

[16]The new abbreviations used in (24) are as below:

QSTORE: QUANTIFIER-STORE	INST: INSTANCE
RESTR: RESTRICTION	RESTIND: RESTRICTED-INDEX

inalienable-poss: inalienable-possessive

In this kind of honorification, when an entity is not the inalienable part of the honored possessor, the entity is not honored as illustrated in (25).

(25)   ku pwun-uy   kay-ka   cham yengliha-ta.
          the man (hon)-gen dog-nom very   cunning-dec
          'The man's dog is very cunning.'

In sentence (25) *kay* 'dog' is not an inalienable part of the possessor *ku pwun* 'the man' and thus *kay* is not honored by the speaker. This information is consistent with the background information supplied by the adjective *yengliha-ta* since there are no honorific morphemes in that adjective. Consequently, the sentence in (25) is felicitous though the possessor is honored by the speaker.

Returning to the sentence in (3), let us consider the adjective *potulawu-si-e*.

(3)   ku pwun-uy   son-i   cham potulawu-si-e.
          the man (hon)-gen hand-nom very   soft-hon-dec
          'The man's hands are very soft.'

Because this adjective contains the honorific infix *si* and the nonhonorific informal ending *e*, the LOCAL value for that adjective is as shown in (26).

(26)
$$
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \text{HEAD} & adjective[fin, dec] \\ \text{SUBCAT} & \langle \text{NP}[nom]_{\boxed{1}} \rangle \end{bmatrix} \\[2em]
\text{CONT} & \begin{bmatrix} \text{RELATION} & soft \\ \text{SOFT-ENTITY} & \boxed{1} \end{bmatrix} \\[2em]
\text{CONX} & \begin{bmatrix} \text{C-INDICES} & \begin{bmatrix} \text{SPEAKER} & \boxed{2} \\ \text{ADDRESSEE} & \boxed{3} \end{bmatrix} \\[3em] \text{BACKGR} & \left\{ \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{2} \\ \text{HONORED} & \boxed{1} \\ \text{POLARITY} & 1 \end{bmatrix}, \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{2} \\ \text{HONORED} & \boxed{3} \\ \text{POLARITY} & 0 \\ \text{FORMAL} & 0 \\ \boxed{2} \geq \boxed{3} \end{bmatrix} \right\} \end{bmatrix}
\end{bmatrix}
$$

In sentence (3) the honored subject referent is not a person and thus cannot have social status. It is the possessor of the subject referent who has higher social status than the speaker and the addressee. As illustrated in (24) the background information supplied by *ku pwun-uy son-i* specifies that the speaker shows honor to the subject referent. As shown in (26) the background information provided by *potulawu-si-e* specifies that while the speaker shows honor to the subject referent, the speaker does not show honor to the addressee. Because there is no inconsistency in these background conditions, the sentence in (3) is felicitous in the context where the social status of the speaker is equal to or higher than that of the addressee and the possessor of the subject referent has higher social status than the speaker and the addressee.

Let us now explain why the sentence in (21) is not felicitous.

(21)   #ku salam-uy son-i   cham potulawu-si-e.
         the man-gen hand-nom very soft-hon-dec

         'The man's hands are very soft.'

In (21) the possessor is not honored by the speaker (*ku salam* is not an honored form of a noun) and thus the whole phrase *ku salam-uy son-i* has the background information that the subject referent is not honored by the speaker. On the other hand, since the adjective *potulawu-si-e* contains the honorific infix *si*, it has the background information that the speaker shows honor to the referent of the subject. These two pieces of background information are not consistent and thus cannot be unified. As a result of this inconsistency in the background information, the sentence in (21) is not felicitous. Since the information that the speaker does not show honor to the subject referent cannot be compatible with the information that the same speaker shows honor to the same subject referent, there is no context where sentence (21) can be felicitous.

4.2.2 Occurrence of Object Honorification

Let us look at the sentences in (4) where object honorification should be considered.

(4)   a.   tongsayng-i   kyocang sensayng-nim-ul cohaha-ni?
                younger brother-nom principal teacher-hon-acc like-int

                'Does my younger brother like his principal?'

       b.   tongsayng-i   sensayng-nim-kkey   chayk-ul tuli-ess-e.
                younger brother-nom teacher-hon-dat (hon) book-acc give (hum)-past-dec

                'My younger brother gave a book to his teacher.'

       c.   tongsayng-i   chinkwu-eykey chayk-ul cwu-ess-e.
                younger brother-nom friend-dat   book-acc give-past-dec

                'My younger brother gave a book to his friend.'

Since the phrase *tongsayng-i* which appears in (4a-4c) does not contain an honorific marker, its LOCAL value is as shown in (27).

(27)
$$
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \text{HEAD} & noun[nom] \\ \text{SUBCAT} & \langle\rangle \end{bmatrix} \\[2ex]
\text{CONT|INDEX} & \boxed{1} \\[2ex]
\text{CONX} & \begin{bmatrix} \text{C-INDICES} & \begin{bmatrix} \text{SPEAKER} & \boxed{4} \\ \text{ADDRESSEE} & \boxed{5} \end{bmatrix} \\[3ex]
\text{BACKGR} & \left\{ \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{4} \\ \text{HONORED} & \boxed{1} \\ \text{POLARITY} & 0 \\ \boxed{4} \geq \boxed{1} \end{bmatrix} , \right\} \end{bmatrix}
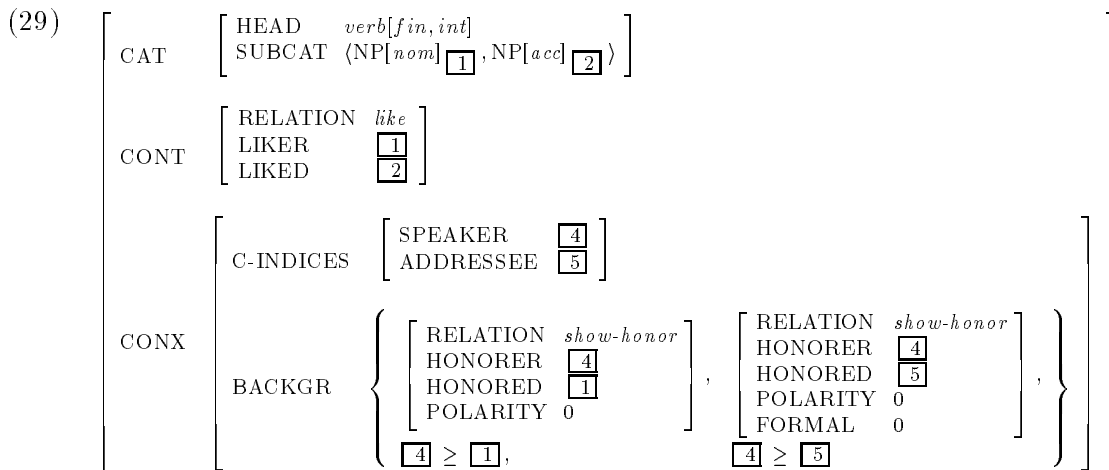\end{bmatrix}
$$

As described in (27) the background information specifies that the speaker does not show honor to the referent of the subject since the social status of the latter is not higher than that of the former.

The direct object NP *kyocang sensayng-nim-ul* in (4a) has the honorific suffix *nim*. Thus its LOCAL value is as shown in (28).

(28)
$$
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \text{HEAD} & noun[acc] \\ \text{SUBCAT} & \langle\rangle \end{bmatrix} \\[2ex]
\text{CONT|INDEX} & \boxed{2} \\[2ex]
\text{CONX} & \begin{bmatrix}
\text{C-INDICES} & \begin{bmatrix} \text{SPEAKER} & \boxed{4} \\ \text{ADDRESSEE} & \boxed{5} \end{bmatrix} \\[3ex]
\text{BACKGR} & \left\{ \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{4} \\ \text{HONORED} & \boxed{2} \\ \text{POLARITY} & 1 \\ \boxed{2} > \boxed{4}, & \boxed{2} > \boxed{5} \end{bmatrix}, \right\}
\end{bmatrix}
\end{bmatrix}
$$
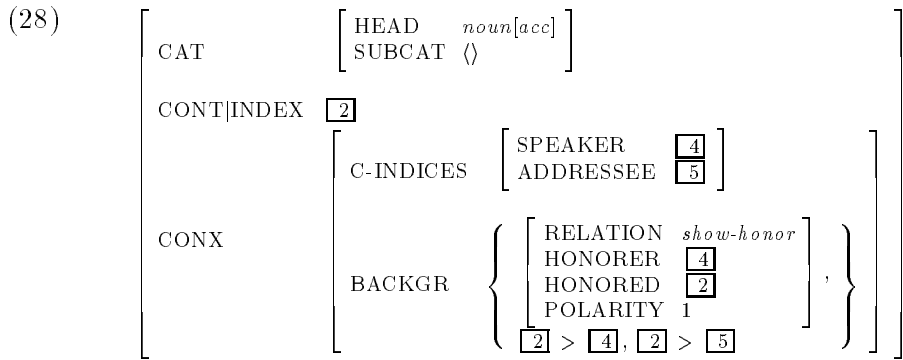
The background information in (28) specifies that the speaker shows honor to the direct object referent since the social status of the latter is higher than that of the former and the addressee.

The verb *cohaha-ni* in (4a) does not have a humble form. Thus from the verb itself we cannot determine whether or not the object referent is honored by the speaker. Since the verb does not contain the honorific infix *si* and an honorific verbal ending, neither the subject referent nor the addressee is honored by the speaker. Accordingly, the LOCAL value for the verb *cohaha-ni* is as shown in (29).[17]

(29)
$$
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \text{HEAD} & verb[fin,int] \\ \text{SUBCAT} & \langle \text{NP}[nom]_{\boxed{1}}, \text{NP}[acc]_{\boxed{2}} \rangle \end{bmatrix} \\[2ex]
\text{CONT} & \begin{bmatrix} \text{RELATION} & like \\ \text{LIKER} & \boxed{1} \\ \text{LIKED} & \boxed{2} \end{bmatrix} \\[3ex]
\text{CONX} & \begin{bmatrix}
\text{C-INDICES} & \begin{bmatrix} \text{SPEAKER} & \boxed{4} \\ \text{ADDRESSEE} & \boxed{5} \end{bmatrix} \\[3ex]
\text{BACKGR} & \left\{ \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{4} \\ \text{HONORED} & \boxed{1} \\ \text{POLARITY} & 0 \\ \boxed{4} \geq \boxed{1}, \end{bmatrix}, \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{4} \\ \text{HONORED} & \boxed{5} \\ \text{POLARITY} & 0 \\ \text{FORMAL} & 0 \\ \boxed{4} \geq \boxed{5} \end{bmatrix}, \right\}
\end{bmatrix}
\end{bmatrix}
$$

The background information in (29) specifies that the speaker does not show honor to the subject referent and the addressee. When looking at the background information shown in (27)–(29), we cannot find any conflict. Thus the sentence in (4a) is felicitous in the context

---

[17] In the diagram '*verb[fin,int]*' means that VERB-INFLECTIONAL-FORM is finite and ENDING-FORM is interrogative.

where the social status of the speaker is equal to or higher than that of the subject referent and the addressee, and the social status of the object referent is higher than that of the speaker and the addressee.

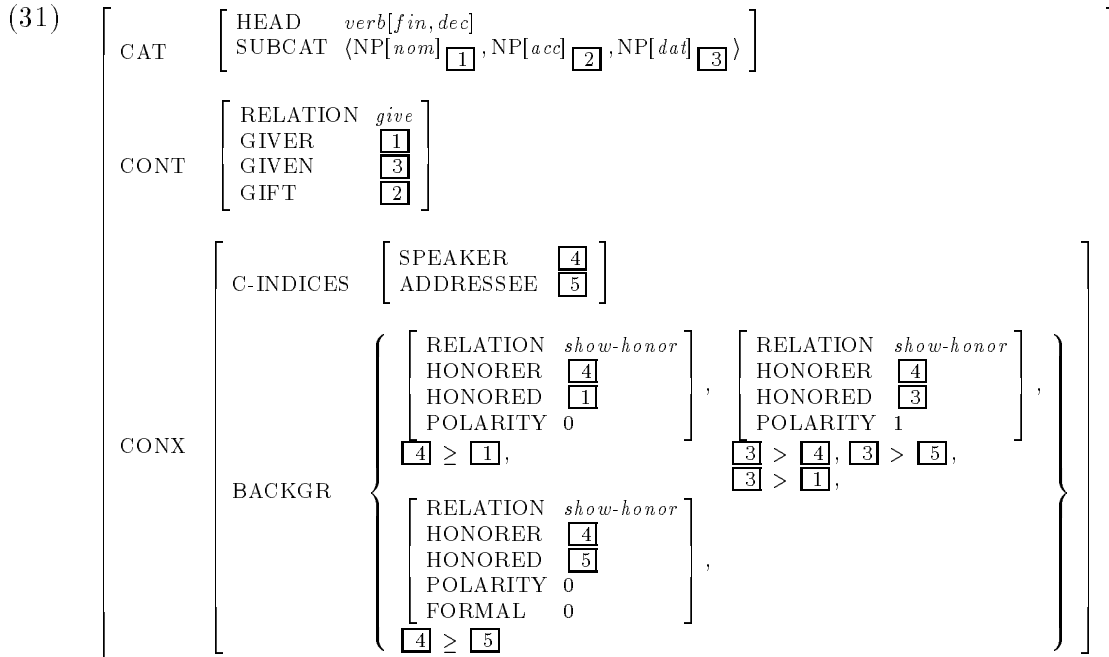Let us now consider the sentence in (4b).

(4) b. tongsayng-i   sensayng-nim-kkey   chayk-ul tuli-ess-e.
         younger brother-nom teacher-hon-dat (hon) book-acc give (hum)-past-dec

         'My younger brother gave a book to his teacher.'

The LOCAL value for the subject NP *tongsayng-i* is as shown in (27). Since the object NP *sensayng-nim-kkey* contains honorific morphemes such as the honorific suffix *nim*, and the dative honorific case marker *kkey*, its LOCAL value is as illustrated in (30).

$$
(30) \quad
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \text{HEAD} & noun[dat] \\ \text{SUBCAT} & \langle\rangle \end{bmatrix} \\[2ex]
\text{CONT|INDEX} & \boxed{3} \\[2ex]
\text{CONX} & \begin{bmatrix}
\text{C-INDICES} & \begin{bmatrix} \text{SPEAKER} & \boxed{4} \\ \text{ADDRESSEE} & \boxed{5} \end{bmatrix} \\[3ex]
\text{BACKGR} & \left\{ \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{4} \\ \text{HONORED} & \boxed{3} \\ \text{POLARITY} & 1 \end{bmatrix}, \right\} \\
& \boxed{3} > \boxed{4}, \boxed{3} > \boxed{5}
\end{bmatrix}
\end{bmatrix}
$$

The background information in (30) specifies that the speaker shows honor to the indirect object referent since the social status of the latter is higher than that of the former and the addressee.

The use of the humble verb form *tuli* in (4b) indicates that the object referent is honored by the speaker and the social status of the object referent is higher than that of the subject referent. Neither the honorific infix *si* nor an honorific verbal ending is contained in the verb *tuli-ess-e*. Thus its LOCAL value is as described in (31).

(31)

$$
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \text{HEAD} & verb[fin,dec] \\ \text{SUBCAT} & \langle \text{NP}[nom]_{\boxed{1}}, \text{NP}[acc]_{\boxed{2}}, \text{NP}[dat]_{\boxed{3}} \rangle \end{bmatrix} \\[3ex]
\text{CONT} & \begin{bmatrix} \text{RELATION} & give \\ \text{GIVER} & \boxed{1} \\ \text{GIVEN} & \boxed{3} \\ \text{GIFT} & \boxed{2} \end{bmatrix} \\[5ex]
\text{CONX} & \begin{bmatrix} \text{C-INDICES} & \begin{bmatrix} \text{SPEAKER} & \boxed{4} \\ \text{ADDRESSEE} & \boxed{5} \end{bmatrix} \\[3ex]
\text{BACKGR} & \left\{ \begin{array}{l} \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{4} \\ \text{HONORED} & \boxed{1} \\ \text{POLARITY} & 0 \end{bmatrix}, \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{4} \\ \text{HONORED} & \boxed{3} \\ \text{POLARITY} & 1 \end{bmatrix}, \\ \boxed{4} \geq \boxed{1}, \quad\quad\quad \boxed{3} > \boxed{4}, \boxed{3} > \boxed{5}, \\ \quad\quad\quad\quad\quad\quad\quad \boxed{3} > \boxed{1}, \\ \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{4} \\ \text{HONORED} & \boxed{5} \\ \text{POLARITY} & 0 \\ \text{FORMAL} & 0 \end{bmatrix}, \\ \boxed{4} \geq \boxed{5} \end{array} \right\} \end{bmatrix}
\end{bmatrix}
$$

The background information in diagram (31) specifies that the speaker shows honor to the referent of the indirect object, whereas the speaker does not show honor to the subject referent and the addressee. No conflict arises from the background information shown in diagrams (27), (30), and (31). Consequently, the sentence in (4b) is felicitous in the context where the referent of the indirect object has higher social status than any other individuals involved in the sentence and the social status of the speaker is equal to or higher than that of the subject referent and the addressee.

Likewise, a similar explanation applies to the felicity of the sentence in (4c).

(4)   c.   tongsayng-i   chinkwu-eykey chayk-ul cwu-ess-e.
            younger brother-nom friend-dat   book-acc give-past-dec

       'My younger brother gave a book to his friend.'

The subject NP *tongsayng-i* provides the background information that the speaker does not show honor to the subject referent and the indirect object NP *chinkwu-eykey* provides the background information that the speaker does not show honor to the indirect object referent. The verb *cwu-ess-e* is not a humble form and contains the nonhonorific verbal ending *e*. The honorific infix *si* does not appear in the verb. So the verb *cwu-ess-e* supplies the background information that none of the individuals involved in sentence (4c) is honored by the speaker. There is no incompatibility in the pool of background information provided by the subject NP, the object NP, and the verb. Thus sentence (4c) is felicitous in the context where the social status of the speaker is equal to or higher than any other individuals involved in the sentence.

When an individual mentioned in a sentence is respected by the speaker and the object referent is an inalienable part of the honored individual, the object referent is also honored by the speaker as in subject honorification. Let us see the examples in (32).

(32) a.   Soochul-i   sensayng-nim-uy aphun sonkalak-ul
                 nom teacher-hon-gen sore   finger-acc
          chilyoha-ye tuli-ess-e.
          treat-comp serve (hum)-past-dec

          'Soochul rendered the service of treating the sore finger of his teacher.' (literally)

    b.   Soochul-i   chinkwu-uy aphun sonkalak-ul
                 nom friend-gen   sore   finger-acc
          chilyoha-ye cwu-ess-e.
          treat-comp serve-past-dec

          'Soochul rendered the service of treating the sore finger of his friend.' (literally)

In (32a) a finger is an inalienable part of the honored possessor *sensayng-nim* and thus is also honored by the speaker as indicated by the complex verb *chilyoha-ye tuli-ess-e* which is the humble form of the complex verb *chilyoha-ye cwu-ess-e*.[18] So, the sentence in (32a) is felicitous in the context where the social status of the speaker is equal to or higher than that of the subject referent and the addressee, and the individual who possesses the inalienable object referent has higher social status than the speaker and the addressee. Since the possessor *chinkwu* is not honored by the speaker in (32b), the possessed one is not honored, either. Thus the sentence in (32b) is felicitous in the context where the speaker has higher social status than any other individuals involved in the sentence.

On the other hand, as in subject honorification, if an entity is alienable from the possessor, the entity is not honored by the speaker even though its possessor is honored. This is illustrated in (33).

(33) a.   #tongsayng-i   sensayng-nim-uy kay-eykey.
          younger brother-nom teacher-hon-gen dog-dat
          ppyetakwi-lul tuli-ess-e.
          bones-acc   give (hum)-past-dec

          'My younger brother gave bones to the dog of his teacher.'

    b.   tongsayng-i   sensayng-nim-uy kay-eykey
          younger brother-nom teacher-hon-gen dog-dat
          ppyetakwi-lul cwu-ess-e.
          bones-acc   give-past-dec

          'My younger brother gave bones to the dog of his teacher.'

Because a dog is not inalienable from its possessor *sensayng-nim*, it cannot be honored by the speaker. The reason why the sentence in (33a) is infelicitous is that the background information supplied by the indirect object phrase *sensayng-nim-uy kay-eykey* (i.e., the information that the speaker does not show honor to the referent of the indirect object) is not compatible

---

[18]In Korean more than two verbs can be combined to form a complex verb. In this case the tense morpheme and the verbal ending attach only to the verb occurring last in the complex verb. When a verb is used as the last verb in a complex verb, it has a meaning different from the meaning it has when it is used independently.

with the background information provided by the verb *tuli-ess-e* (that is, the information that the speaker shows honor to the referent of the indirect object). In (33b), however, there is no such incompatibility in the background information (namely, the information that the speaker does not show honor to the indirect object referent is shared by the verb *cwu-ess-e* and the phrase *sensayng-nim-uy kay-eykey*). Thus the sentence in (33b) is felicitous in the context where the possessor of the alienable object referent has higher social status than the speaker and the addressee, and the social status of the speaker is equal to or higher than that of the subject referent and the addressee.

4.2.3   Occurrence of Addressee Honorification

The relative order in social status between the speaker and the addressee, and the relationship between them are indicated by the verbal ending. Let us consider why the sentence in (6) is felicitous.

(6)   Minsoo-ka mayil   sanchaykha-yeyo.
              nom every day take a walk-dec (hon)

        'Minsoo takes a walk every day.'

In (6) the subject NP *Minsoo-ka* does not contain any honorific morphemes. Thus its LOCAL value is as illustrated in (34).

$$
(34) \quad
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \text{HEAD} & noun[nom] \\ \text{SUBCAT} & \langle \rangle \end{bmatrix} \\[2ex]
\text{CONT|INDEX} & \boxed{1} \\[2ex]
\text{CONX} & \begin{bmatrix}
\text{C-INDICES} & \begin{bmatrix} \text{SPEAKER} & \boxed{2} \\ \text{ADDRESSEE} & \boxed{3} \end{bmatrix} \\[3ex]
\text{BACKGR} & \left\{ \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{2} \\ \text{HONORED} & \boxed{1} \\ \text{POLARITY} & 0 \\ \boxed{2} \geq \boxed{1} \end{bmatrix}, \right\}
\end{bmatrix}
\end{bmatrix}
$$

The background information in (34) specifies that the speaker does not show honor to the subject referent since the social status of the former is equal to or higher than that of the latter.

The verb *sanchaykha-yeyo* appearing in (6) does not contain the honorific infix *si*, but has the honorific informal verbal ending *yeyo*. The use of the honorific verbal ending indicates that the speaker shows honor or courtesy to the addressee and that the social status of the speaker is not equal to that of the addressee. Thus the LOCAL value for the verb is as shown in (35).

(35)

$$
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \text{HEAD} & verb[fin,dec] \\ \text{SUBCAT} & \langle \text{NP}[nom]_{\boxed{1}} \rangle \end{bmatrix} \\[2ex]
\text{CONT} & \begin{bmatrix} \text{RELATION} & take\text{-}a\text{-}walk \\ \text{TAKE-A-WALKER} & \boxed{1} \end{bmatrix} \\[2ex]
\text{CONX} & \begin{bmatrix} \text{C-INDICES} & \begin{bmatrix} \text{SPEAKER} & \boxed{2} \\ \text{ADDRESSEE} & \boxed{3} \end{bmatrix} \\[2ex]
\text{BACKGR} & \left\{ \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{2} \\ \text{HONORED} & \boxed{1} \\ \text{POLARITY} & 0 \\ \boxed{2} \geq \boxed{1}, \end{bmatrix}, \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{2} \\ \text{HONORED} & \boxed{3} \\ \text{POLARITY} & 1 \\ \text{FORMAL} & 0 \\ \boxed{2} \neq \boxed{3} \end{bmatrix}, \right\} \end{bmatrix}
\end{bmatrix}
$$

The notation $\boxed{2} \neq \boxed{3}$ in (35) stands for the diagram in (36).

(36)

$$
\begin{bmatrix}
\text{RELATION} & not\text{-}equal\text{-}s\text{-}status \\
\text{NOT-EQUAl-SP} & \boxed{2} \\
\text{NOT-EQUAL-AD} & \boxed{3} \\
\text{POLARITY} & 1
\end{bmatrix}
$$

The background information in (35) specifies that although the speaker does not show honor to the subject referent, the speaker shows honor or courtesy to the addressee. No conflict arises in the background information shown in (34) and (35). Thus the sentence in (6) is felicitous in the context where the social status of the speaker is equal to or higher than that of the subject referent and is not equal to that of the addressee.

4.2.4 Occurrence of Multiple Honorification

In a single sentence more than one type of honorification can occur. As an example, let us consider the sentence in (37).

(37)   Park cenmwu-nim-i   Kim pwucang-nim-ul
           executive director-hon-nom   department director-hon-acc
       Choi sacang-nim-kkey   sokayha-si-ess-eyo.
           president-hon-dat (hon) introduce-hon-past-dec (hon)

       'Executive director Park introduced department director Kim to president Choi'

In sentence (37) all three types of honorification (that is, subject honorification, object honorification, and addressee honorification) occur. The phrase *Park cenmwu-nim-i* contains the honorific suffix *nim*. Thus the LOCAL value of the phrase is as illustrated in (38).

(38)
$$
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \text{HEAD} & noun[nom] \\ \text{SUBCAT} & \langle\rangle \end{bmatrix} \\[2ex]
\text{CONT}|\text{INDEX} & \boxed{1} \\[2ex]
\text{CONX} & \begin{bmatrix}
\text{C-INDICES} & \begin{bmatrix} \text{SPEAKER} & \boxed{4} \\ \text{ADDRESSEE} & \boxed{5} \end{bmatrix} \\[3ex]
\text{BACKGR} & \left\{ \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{4} \\ \text{HONORED} & \boxed{1} \\ \text{POLARITY} & 1 \\ \boxed{1} > \boxed{4}, & \boxed{1} > \boxed{5} \end{bmatrix}, \right\}
\end{bmatrix}
\end{bmatrix}
$$

The background information in diagram (38) specifies that the speaker honors the subject referent since the social status of the latter is higher than that of the former and the addressee.

The direct object phrase *Kim pwucang-nim-ul* contains the honorific suffix *nim*. Thus the LOCAL value of the phrase is as shown in (39).

(39)
$$
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \text{HEAD} & noun[acc] \\ \text{SUBCAT} & \langle\rangle \end{bmatrix} \\[2ex]
\text{CONT}|\text{INDEX} & \boxed{2} \\[2ex]
\text{CONX} & \begin{bmatrix}
\text{C-INDICES} & \begin{bmatrix} \text{SPEAKER} & \boxed{4} \\ \text{ADDRESSEE} & \boxed{5} \end{bmatrix} \\[3ex]
\text{BACKGR} & \left\{ \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{4} \\ \text{HONORED} & \boxed{2} \\ \text{POLARITY} & 1 \\ \boxed{2} > \boxed{4}, & \boxed{2} > \boxed{5} \end{bmatrix}, \right\}
\end{bmatrix}
\end{bmatrix}
$$

Diagram (39) provides the background information that the speaker honors the direct object referent since the latter has higher social status than the former and the addressee.

The indirect object phrase *Choi sacang-nim-kkey* contains the honorific suffix *nim* and the honorific dative case marker *kkey*. Thus the LOCAL value of the phrase is as shown in diagram (40).

(40)
$$
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \text{HEAD} & noun[dat] \\ \text{SUBCAT} & \langle\rangle \end{bmatrix} \\[2ex]
\text{CONT}|\text{INDEX} & \boxed{3} \\[2ex]
\text{CONX} & \begin{bmatrix}
\text{C-INDICES} & \begin{bmatrix} \text{SPEAKER} & \boxed{4} \\ \text{ADDRESSEE} & \boxed{5} \end{bmatrix} \\[3ex]
\text{BACKGR} & \left\{ \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{4} \\ \text{HONORED} & \boxed{3} \\ \text{POLARITY} & 1 \\ \boxed{3} > \boxed{4}, & \boxed{3} > \boxed{5} \end{bmatrix}, \right\}
\end{bmatrix}
\end{bmatrix}
$$

The background information in (40) specifies that the speaker honors the indirect object referent since the social status of the latter is higher than that of the former and the addressee.

The verb *sokayha-si-ess-eyo* contains the honorific infix *si* and the honorific informal verbal ending *eyo*. There is, however, no suppletive humble form of the verb and thus we cannot know whether an object referent is honored by the speaker from the verb itself. So the LOCAL value of the verb is as illustrated in (41).

$$
(41)\quad
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \text{HEAD} & verb[fin,dec] \\ \text{SUBCAT} & \langle \text{NP}[nom]\boxed{1}, \text{NP}[acc]\boxed{2}, \text{NP}[dat]\boxed{3}\rangle \end{bmatrix} \\[6pt]
\text{CONT} & \begin{bmatrix} \text{RELATION} & introduce \\ \text{INTRODUCER} & \boxed{1} \\ \text{INTRODUCED} & \boxed{2} \\ \text{INTRODUCEE} & \boxed{3} \end{bmatrix} \\[10pt]
\text{CONX} & \begin{bmatrix}
\text{C-INDICES} & \begin{bmatrix} \text{SPEAKER} & \boxed{4} \\ \text{ADDRESSEE} & \boxed{5} \end{bmatrix} \\[8pt]
\text{BACKGR} & \left\{ \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{4} \\ \text{HONORED} & \boxed{1} \\ \text{POLARITY} & 1 \end{bmatrix}, \begin{bmatrix} \text{RELATION} & show\text{-}honor \\ \text{HONORER} & \boxed{4} \\ \text{HONORED} & \boxed{5} \\ \text{POLARITY} & 1 \\ \text{FORMAL} & 0 \end{bmatrix}, \right\} \\[10pt]
& \boxed{1} > \boxed{4},\ \boxed{1} > \boxed{5},\qquad \boxed{4} \neq \boxed{5}
\end{bmatrix}
\end{bmatrix}
$$

The background information in diagram (41) specifies that the speaker honors the subject referent since the social status of the latter is higher than that of the former and the addressee and that the speaker shows honor or courtesy to the addressee since the social status of the speaker is not equal to that of the addressee. There is no conflict in the pool of the background information collected from the diagrams shown in (38)–(41). Thus the sentence in (37) is felicitous in the context where the social status of the subject referent, the direct object referent, and the indirect object referent is higher than that of the speaker and the addressee, and the social status of the speaker is not equal to that of the addressee.

The advantages of our new analysis over the previous analyses are clearly shown when we explain the felicity of sentence (37). First, since all three types of honorification occur in sentence (37), they all must be considered simultaneously to judge whether the sentence is felicitous. The new analysis checks whether all relevant types of honorification occur properly in a sentence and thus gives an appropriate explanation of whether the sentence is felicitous. On the other hand, the previous analyses paid attention to subject honorification. By looking at just subject honorification it is impossible to determine whether a sentence is felicitous. Second, the felicity of a sentence cannot be explained by the occurrence of agreement in background information. For example, in sentence (37) the background information that the speaker shows honor or courtesy to the addressee and the speaker honors the direct object referent and the indirect object referent is supplied only once. Thus the notion of agreement cannot be applied in this case. The new analysis solves this problem by explaining that a sentence is felicitous when there is no incompatibility in background information. Finally, a sentence can be felicitous only in a restricted context. Since the new analysis incorporates the information about relative social status in the lexical sign, it can provide the context where a sentence is felicitous. The previous analyses, however, do not include such information and thus cannot provide the context in which a sentence is felicitous.

5   Honorification in Other Constructions

Up to now we have considered the honorification phenomenon occurring in the construction which contains no other verbs than a main verb. The honorification system, however, applies to other types of constructions. The examples which contain the *equi* verb 'persuade' are shown in (42).

(42)   a.   tongsayng-i   sensayng-nim-kkey   ku khullep-ey
               younger brother-nom teacher-hon-dat (hon) the club-postp
               kaipha-si-lako seltukha-yess-e.
               join-hon-comp persuade-past-dec

               'My younger brother persuaded his teacher to join the club.'

       b.   Kwon sensayng-nim-kkeyse   tongsayng-eykey   ku khullep-ey
                    teacher-hon-nom (hon) younger brother-dat the club-postp
               kaipha-lako seltukha-si-ess-e.
               join-comp   persuade-hon-past-dec

               'Teacher Kwon persuaded my younger brother to join the club.'

In sentence (42a) the PERSUADEE has higher social status than the speaker and thus both the phrase corresponding to the PERSUADEE and the verb describing the action of the PERSUADEE contain an honorific morpheme. To the contrary, in sentence (42b) the PERSUADER has higher social status than the speaker. Consequently, the phrase corresponding to the PERSUADER and the verb depicting the action of the PERSUADER have an honorific morpheme.

Besides the construction containing an *equi* verb the honorification phenomenon can occur in the constructions which contain a *raising* verb and in the unbounded dependency constructions that involve such phenomena as topicalization, relative clauses, and *tough* movement. The criteria for honorification explained in Section 4.2 apply to all these constructions.

Even if a sentence contains an embedded clause, the person who is in the position of honoring the individuals mentioned in the embedded clause is not the original speaker of the embedded clause, but the speaker of the whole sentence. Let us look at the example in (43).

(43)   Chun pwucang-nim-i   ku selyu-lul   pwuchi-si-ess-eyo.
               department director-hon-nom the document-acc mail-hon-past-dec (hon)

           'Department director Chun mailed the document.'

Let us assume that the speaker of sentence (43) is *Kang kwacang* 'chief section Kang', who has lower social status than department director Chun. The fact that chief section Kang uttered sentence (43) is conveyed in the form of sentence (44a), not in the form of sentence (44b) when the person who conveys the fact has higher social status than department director Chun.

(44) a.　　　Kang kwacang-i　　　　Chun pwucang-i
　　　　　　　chief section-nom　　　　department director-nom
　　　　　　　ku selyu-lul　　　pwuchi-ess-ta-ko　　malha-yess-e.
　　　　　　　the document-acc mail-past-dec-comp say-past-dec
　　　　　　　'Chief section Kang said that department director Chun mailed the document.'

　　　b.　　#Kang kwacang-i　　　　Chun pwucang-nim-i
　　　　　　　chief section-nom　　　　department director-hon-nom
　　　　　　　ku selyu-lul　　　pwuchi-si-ess-ta-ko　　malha-yess-e.
　　　　　　　the document-acc mail-hon-past-dec-comp say-past-dec
　　　　　　　'Chief section Kang said that department director Chun mailed the document.'

As shown in (44a), since the speaker of the whole sentence has higher social status than department director Chun mentioned in the embedded clause, the latter is not honored by the former. This result follows directly from the new analysis of honorification. In the new analysis the person who is in the position of honoring individuals involved in a sentence is the speaker of the sentence regardless of whether the sentence contains embedded clauses or not. Thus the new analysis applies to the honorification phenomenon occurring in the sentence that contains embedded clauses, too.

6　Concluding Remarks

In every sentence at least a speaker, an addressee, and a subject referent are involved (when the first-person singular pronoun is the subject of a sentence, the subject referent and the speaker refer to the same person and when the second-person singular pronoun is the subject of a sentence, the subject referent and addressee refer to the same person). If the main verb in a sentence is other than an intransitive one (for example, a transitive verb or a dative verb), an object referent is additionally involved. It is the speaker who shows honor to the subject referent, the object referent, and addressee.

Subject honorification occurs when the subject referent has higher social status than the speaker and addressee, whereas object honorification occurs when the object referent has higher social status than the speaker and addressee. If the subject referent or the object referent is an inalienable part of an individual and the individual is honored by the speaker, the subject referent or the object referent is also honored by the speaker. The use of an honorific verbal ending in a sentence indicates that the speaker shows honor or courtesy to the addressee. In this case the social status of the speaker is not equal to that of the addressee. Since the sentence-external individuals such as the speaker and addressee play an important role in all three types of honorification, the Korean honorification system cannot be explained without taking them into account.

To determine whether a certain sentence is felicitous, it is necessary to check at least whether subject honorification and addressee honorification occur properly in the sentence since a subject NP and a verb appear in every sentence. Thus just looking at subject honorification in a sentence is not enough. Furthermore, a sentence cannot be felicitous unconditionally and thus is felicitous only in a restricted context. The context in which a sentence is felicitous can be provided by considering relative social status of the individuals involved in the sentence.

The HPSG formalism makes it possible to include the information about speaker and addressee and the information about relative social status, whereas in other formalisms it is impossible to include them. These pieces of contextual information are indispensable to the explanation of the Korean honorification system. Thus HPSG is the formalism that enables us to account for the honorification phenomenon in Korean correctly.

The new approach based on the HPSG formalism overcomes the shortcomings of the previous approaches by considering the types of honorification relevant to a sentence simultaneously and by incorporating the information about social status and the sentence-external individuals. Moreover, the new approach can explain why a certain dialogue is incoherent with respect to honorification though each of the sentences occurring in the dialogue is felicitous by itself. Since the new approach includes the information about relative social status of the individuals involved in a sentence, it can check whether incompatibility occurs in the order of the social status of the persons involved in a dialogue consisting of sentences. If incompatibility occurs in the relative order of the social status of the individuals involved in a dialogue, the dialogue is incoherent. The previous approaches, however, cannot find this kind of inconsistency in a dialogue when each of the sentences comprised in the dialogue is felicitous.

Acknowledgements

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6

Case Assignment in Polish: Towards an HPSG Analysis

Adam Przepiórkowski

Abstract

We formulate within Head-driven Phrase Structure Grammar a theory of case which is based on the structural/lexical case dichotomy as developed within the Government and Binding framework. We argue that this dichotomy holds for Polish, a relatively inflectional Slavic language, and give examples of tests which allow to determine which morphological cases belong to which syntactical (i.e., structural or lexical) cases. On the basis of these observations we present a Case Principle for Polish responsible for morphological realization of structural cases. In the second part of the paper we give an account of the infamous problem of Slavic numerals, concentrating however solely on Polish. We show that the distribution and inflection of numeral phrases confirms the case dichotomy in a striking way. We come up with HPSG lexical entries for all main classes of Polish numerals, including the paucal and the quirky indefinite numerals. In the last section of this paper we argue that in Polish, unlike in German and Russian, passivization does not seem to depend on the structural/lexical case dichotomy.

1   Introduction

In this paper, we will present a basic theory of case for Polish. This theory, developed in the framework of Head-driven Phrase Structure Grammar, is deeply embedded in the tradition of generative grammar (in the broad sense of the term) and it borrows freely from Chomsky's Goverment and Binding Theory.

However, we will not deal here with the relationship between meaning and case (if any); our approach will be — to use the terminology of Mel'čuk (1986) — syntagmatically (rather than paradigmatically) oriented. We will also not succumb to the temptation of defining the notion of case. This (by no means trivial!) theoretical task is well outwith the scope of this paper.[1]

1.1   A Historical Note

It will not be an exaggeration to say that everything that has been written about case within the framework of HPSG stands in a strong relationship with the Case Theory of Government and Binding (GB). For Pollard and Sag (1994) this relation is wholesale rejection, while for Heinz and Matiasek (1994) it is development. This subsection will present some of the most prominent assumptions regarding case which exist within GB.

In GB, Case[2] is mainly a structural phenomenon: the Case an NP receives in a sentence depends on its position in the derivational tree of this sentence. Thus, as shown in figure 1, complements of a verb get the accusative Case, while the subject receives the nominative Case.

This is explained by the fact that verbs which govern (i.e., are close to, in a certain configurational sense) their complements assign the accusative, while INFL nodes (representing a bundle of features related to tense and agreement), which govern subjects, assign the nominative Case.

---

[1] See, however, Mel'čuk (1986) and Comrie (1986) for some attempts.

[2] GB distingushes between morphological case (written with the small 'c') and abstract Case (capital 'C'). Languages differ in the extent to which they exhibit case, but they are all assumed to have abstract Case.
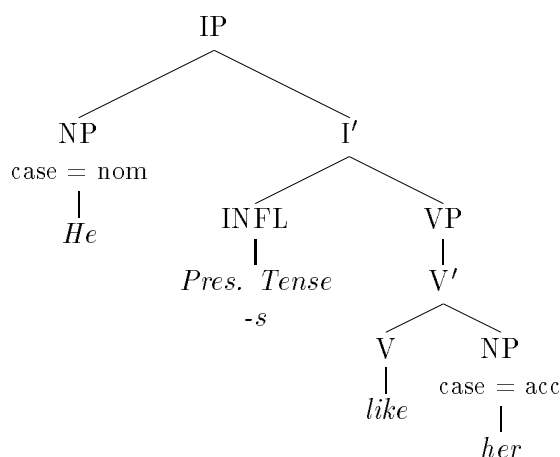
Figure 1: Derivational tree of *He likes her*

This theory works quite well for English — it neatly explains some syntactic phenomena, in particular the phenomenon of passivization exemplified below.

(1) He_{nom} likes her_{acc}. $\xrightarrow{pass}$ She_{nom} is liked.

According to GB, passivization is — simplifying a little — nothing more than adding the passive morpheme (*-en*) to the verb. This morpheme, in turn, has some very peculiar properties: it *absorbs* both the case assigned by the verb in question, and the so-called external theta role. The latter property simply means that thus affected verb does not sanction a subject, while the former that the complement of the verb does not receive Case. However, according to another principle of GB, the Case Filter, every (overt) NP *must* be assigned Case. Hence, in order to get Case, the complement has to move to a vacant position (leaving a trace behind) where Case can be assigned. Such a position is here the subject position which, according to the Extended Projection Principle, has to be present in the tree even if there is no subject (as in the case of passive verbs). But the Case it receives is not accusative anymore; as the complement is now governed by INFL, it receives the nominative Case. This is illustrated by figure 2.

Even though the Case Theory of GB might have worked well for English, it soon became clear that this purely configurational notion of Case cannot provide explanation for, e.g., more sophisticated course of passivization in German. The problem German poses is that passivization in this language affects Case assignment only in some instances. As the reader can easily verify, GB's Case Theory outlined above correctly accounts for (2), but fails in (3) below.[3] In the latter example *ihm* clearly retains its dative Case assigned by the verb.

(2)   a.   *Sie   sieht ihn.*
             She_{nom} sees him_{acc}.

---

[3] These examples come from Haider (1985), cited here after Haegeman (1991).
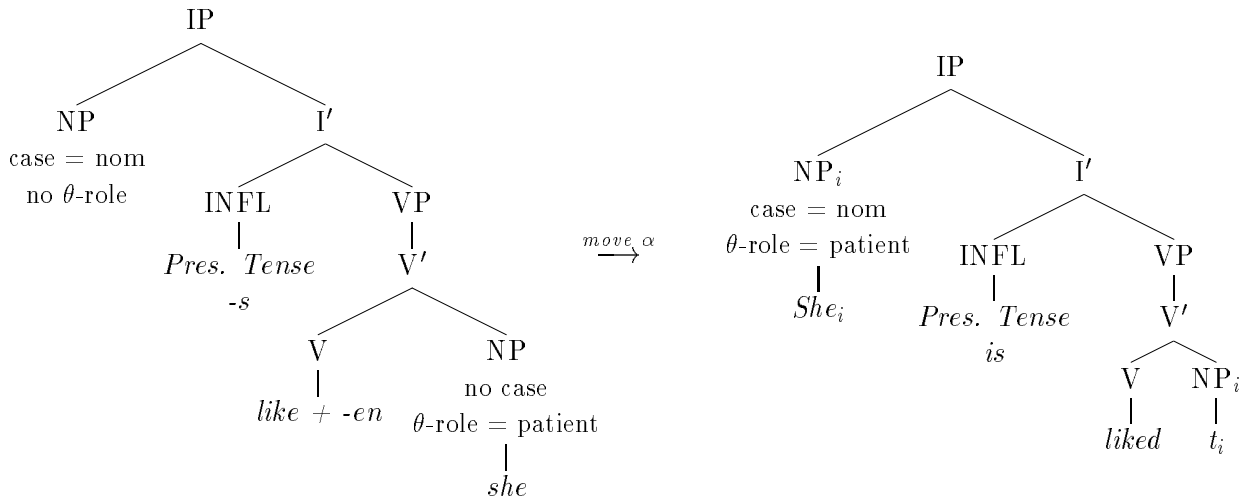
Figure 2: Passivization in GB

'She sees him.'

b.   *Er   wird gesehen.*
     He$_{nom}$ is   seen.

     'He is seen.'

c.   * *Ihn   wird gesehen.*
       He$_{acc}$ is   seen.

     'He is seen.'

(3) a.   *Sie   hilft   ihm.*
          She$_{nom}$ helps him$_{dat}$.

          'She helps him.'

     b.   * *Er   wird geholfen.*
            He$_{nom}$ is   helped.

          'He is helped.'

     c.   *Ihm   wird geholfen.*
          He$_{dat}$ is   helped.

          'He is helped.'

These, and many other Case-related problems with GB's account (also in English, e.g., the problem of the so-called *of*-insertion) lead to substantial changes in the Case Theory and, as a result, Chomsky (1986b) distinguishes between two types of Case assignment: structural, based — as before — on the position of NP at S-structure, and inherent, assigned by the lexical element at D-structure. Unlike structural Case, inherent Case is characterized by its stability: its morphological realization does not change with syntactic environment. Dative case in German (as well as, e.g., genitive in English) is analyzed as an instance of inherent

case, though the extent to which a particular language realizes inherent case is a parameter of the theory; languages can differ significantly in this respect.

Many languages with rich declensional paradigms support this Case dichotomy in interesting ways. We will give examples of such supporting phenomena in the following sections.

1.2   Case in HPSG

There has been no separate theory of case within the framework of HPSG until very recently. Pollard and Sag (1994) put considerable effort into rejecting GB's Case Theory and, by doing so, they announce that no theory of case (or Case) whatsoever is necessary: case is treated in HPSG only as a part of subcategorization requirements. Thus, for example, the value of the SUBCAT feature of the verb *like* would be:

(4)   like: $\langle$NP[*nom*], NP[*acc*]$\rangle$

In this approach phenomena such as passivization are assigned to the lexicon. More specifically, the Passive Lexical Rule takes care of permuting the complements within the SUBCAT list (cf. Pollard and Sag (1987), p. 215 and Pollard and Sag (1994), p. 121) and of changing the CASE values.

However, as Heinz and Matiasek (1994) notice, "this approach fits well with arguments exhibiting the same case in all syntactic constructions. . . but makes it difficult to cope with complements showing variations of case depending on the syntactic context." Such variations exist in German and — appropriately enough — were first (within HPSG) taken into consideration in Nerbonne *et al.* (1994) by Pollard (1994) and, especially, Heinz and Matiasek (1994). In this section, we will present some of the most prominent assumptions of Heinz and Matiasek concerning case; the reader is, however, referred to their article for details and some applications of their theory to German.

Heinz and Matiasek (1994), following Haider (1985), posit two kinds of case: lexical (an analogue of GB's inherent case) and structural. The morphological form of the former is determined via subcategorization requirements. This means that whenever a verb requires its complement to bear a lexical case, it also specifies the morphological realization of this case. Thus, the morphological case form of such a complement cannot vary with the syntactic environment.

Alternatively, a verb (or any other lexical element) can specify its complement as bearing a structural case. In this instance, the morphological form of the complement depends upon (and may alternate with) its syntactic environment, rather than on the lexical item (the verb) in question.[4]

According to Heinz and Matiasek (1994), nominalization is an example of a test checking whether a given complement of a verb has lexical or structural case.[5] This can be illustrated by the following examples:

---

[4] This lexical/structural case dichotomy parallels, of course, GB's inherent/structural case distinction.

[5] However, as Johannes Matiasek points out (pc.), nominalization in German is a more complex matter than Heinz and Matiasek (1994) would suggest.

(5)   a.   *Der   Mann   hilft   dem   Installateur.*
          The   man$_{nom}$ helps   the   plumber$_{dat}$.
          'The man is helping the plumber.'

      b.   *das   Helfen   dem   Installateur*
          the   helping   the   plumber$_{dat}$
          'the help for/*from the plumber'

      c.   *das   Helfen   des   Installateurs*
          the   helping   the   plumber$_{gen}$
          'the help from/*for the plumber'

(6)   a.   *Der   Mann   unterstützt   den   Installateur.*
          The   man$_{nom}$ helps   the   plumber$_{acc}$.
          'The man is helping the plumber.'

      b.   *das   Unterstützen   des   Installateurs*
          the   helping   the   plumber$_{gen}$
          'the help for/from the plumber'

Example (5) shows that the verb *helfen* requires a dative complement. The case of this complement does not change under nominalization, it remains dative. This should be contrasted with the behaviour of the complement of *unterstützen*; the case of this complement changes from accusative to genitive in the process (see (6)). Moreover, the case of the subject changes from nominative to genitive in both cases. These data suggest that dative is a lexical case, while nominative, genitive and accusative are structural: their distribution is a matter of configurational rules, rather than inherent properties of lexical items.

Of course, this does not mean that a given morphological case can only be either lexical or structural. Heinz and Matiasek (1994), developing upon Haider (1985), come up with a type lattice (see figure 3) depicting which morphological cases can be instances of which syntactic (i.e., lexical or structural) cases in German.

In this type lattice we follow the convention used in Heinz and Matiasek (1994) of writing the most general type at the top of the lattice.[6] So, the type *case* has as its subtypes *morph-case* and *syn-case*. The former determines the morhological cases German allows, i.e., its subtypes are *nom* (nominative), *gen* (genitive), *dat* (dative) and *acc* (accusative). On the other hand, *syn-case* determines the syntactic properties of cases; each case marking on an NP is either *structural* or *lexical*. Structural cases are nominative (*snom*), genitive (*sgen*) or accusative (*sacc*), while lexical cases are genitive (*lgen*), dative (*ldat*) and accusative (*lacc*). This, of course, means, that NPs bearing genitive or accusative morphological case are either *structural* or *lexical*, depending on the case assigner. In the sequel of this paper we will usually abbreviate *structural* to *str* and *lexical* to *lex*.

Heinz and Matiasek (1994) do not have much to say about lexical case: its morphological realization is entirely determined within the SUBCAT list, so it does not require a separate

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[6]Note that lattice of figure 3 is not a correct inheritance hierarchy in the sense of Carpenter (1992); it is not a bounded complete partial order. When presenting the case lattice for Polish we will do so using both conventions: that of Heinz and Matiasek (1994) and that of Carpenter (1992).
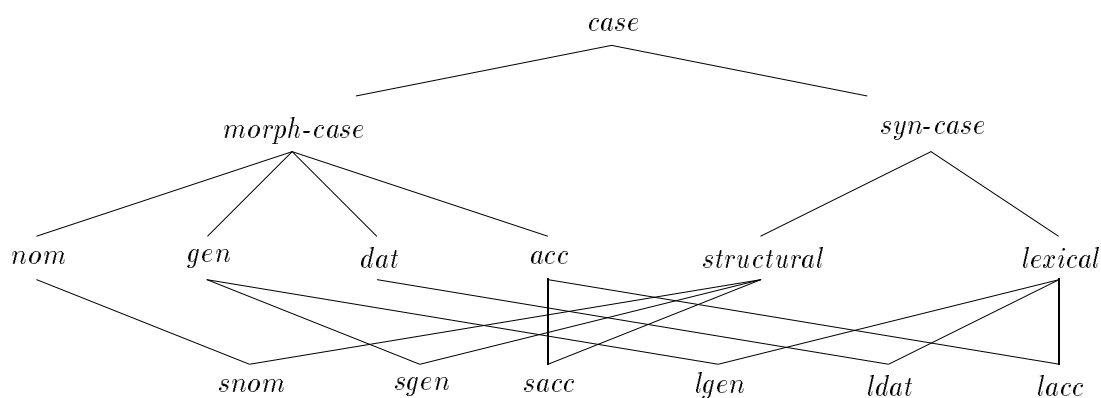
Figure 3: Case hierarchy for German

theory. On the other hand, it is assumed that lexical items do not specify the exact morphological realization of the NP[*str*] they subcategorize for. For example, verbs do not specify their subjects as NP[*nom*], but rather as NP[*str*]. It is the Case Principle, whose scope is somewhat analogous to GB's Case Theory, that determines the exact morphological realization of structural cases. Thus, for instance, values of SUBCAT for *helfen* and *unterstützen* look as follows:

(7)   a.   helfen: ⟨NP[*str*], NP[*ldat*]⟩

     b.   unterstützen: ⟨NP[*str*], NP[*str*]⟩

What morphological value a given instance of structural case gets is decided by Case Principle which, in short, says that an NP[*str*] subject of a verb receives nominative (i.e., *snom*) case, structural complements of verbs receive accusative case (*sacc*), while structural complements of nouns receive genitive case (*sgen*). More precisely (cf. Heinz and Matiasek (1994), p. 34), the following constraints have to be present in German grammar:[7]

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[7] These are constraints in the sense of Pollard and Sag (1987). Of course, constraints in the sense of Carpenter (1992) would have to be imposed upon types (type *phrase* in this case), not feature structures.

(8)
$$
\begin{bmatrix}
phrase \\
\text{SYNSEM} \mid \text{LOC} \mid \text{CAT} \begin{bmatrix} cat \\ \text{HEAD} \begin{bmatrix} verb \\ \text{VFORM } fin \end{bmatrix} \\ \text{SUBCAT } \langle \; \rangle \end{bmatrix} \\
\text{DTRS} \begin{bmatrix} h\text{-}c\text{-}str \\ \text{HEAD-DTR} \mid \ldots \mid \text{SUBCAT } \langle \; NP[str], \ldots \rangle \end{bmatrix}
\end{bmatrix}
$$
$$\Longrightarrow \; \left[\text{DTRS} \mid \text{HEAD-DTR} \mid \ldots \mid \text{SUBCAT } \langle \; NP[snom], \ldots \rangle \right]$$

(9)
$$
\begin{bmatrix}
phrase \\
\text{SYNSEM} \mid \text{LOC} \mid \text{CAT} \begin{bmatrix} cat \\ \text{HEAD } verb \\ \text{SUBCAT } \langle \; \rangle \vee \langle \; synsem \; \rangle \end{bmatrix} \\
\text{DTRS} \begin{bmatrix} h\text{-}c\text{-}str \\ \text{HEAD-DTR} \mid \ldots \mid \text{SUBCAT } \langle \; synsem, NP[str], \ldots \rangle \end{bmatrix}
\end{bmatrix}
$$
$$\Longrightarrow \; \left[\text{DTRS} \mid \text{HEAD-DTR} \mid \ldots \mid \text{SUBCAT } \langle \; synsem, NP[sacc], \ldots \rangle \right]$$

(10)
$$
\begin{bmatrix}
phrase \\
\text{SYNSEM} \mid \text{LOC} \mid \text{CAT} \begin{bmatrix} cat \\ \text{HEAD } noun \\ \text{SUBCAT } \langle \; \rangle \vee \langle \; synsem \; \rangle \end{bmatrix} \\
\text{DTRS} \begin{bmatrix} h\text{-}c\text{-}str \\ \text{HEAD-DTR} \mid \ldots \mid \text{SUBCAT } \langle \; synsem, NP[str], \ldots \rangle \end{bmatrix}
\end{bmatrix}
$$
$$\Longrightarrow \; \left[\text{DTRS} \mid \text{HEAD-DTR} \mid \ldots \mid \text{SUBCAT } \langle \; synsem, NP[sgen], \ldots \rangle \right]$$

The reader will recall that the symbol '$\Longrightarrow$' is used to denote *constraints*, i.e., *conditional feature structures* (cf. Pollard and Sag (1987), p. 43). Thus, for example, (8) should be understood as a condition imposed upon every feature structure of type *phrase*, modelling a finite verb phrase (VFORM *fin*) whose DTRS value is a structure of *head-complement-structure* type, and whose head-daughter specifies its first complement as NP[*str*]. This conditions says, that the first complement of the head-daughter of such a phrase has to bear the nominative case (*snom*).

In the subsequent sections we will follow Heinz and Matiasek (1994) in abbreviating conditional feature structures such as the ones above:

Case Principle
In a *head-complement-structure* of category
- **verb[fin]:** the structural subject has a CASE value of *snom*,
- **verb:** the structural object has a CASE value of *sacc*,
- **noun:** the structural object has a CASE value of *sgen*.

These are the only saturated or almost saturated *head-complement-structures* with structural arguments.[8]

Note, that, given the SUBCATs of *helfen* and *unterstützen* as in (7), this formulation of Case Principle correctly predicts the nominalization facts shown in the examples (5) and (6) on page 196. Of course, the underlying assumption here is that the only change which nominalization (implemented for example as a lexical rule) brings to the SUBCAT list is making each argument optional and possibly specifying that at most one argument is present.

In the remainder of this article we will examine to what extent the lexical vs. structural case dichotomy can be argued for in Polish. We will also attempt to formulate an analogous Case Principle for this language.

2   Structural vs. Lexical Case in Polish

Polish, a language with rich inflectional morphology, shows considerable support for the lexical vs. structural case distinction. The only attempt of formal analysis (in the framework of GB) of how this distinction functions in Polish that we know of is Willim (1990).[9] Our analysis will differ from (the translation into HPSG of) that of Willim in many respects.

2.1   Morphological Case in Polish

There are seven morphological cases in Polish, though vocative can be argued not to be a case in the strict sense: it is used in isolation, mainly for getting attention and for addressing.[10] Of the remaining six, nominative never appears outside sentential subject position,[11] accusative is realized by verbal and prepositional objects, genitive, dative and instrumental occur as arguments of all main lexical categories, and locative is restricted to the prepositional arguments.

---

[8]Structural subject should be understood as an NP element of the SUBJECT list (in the sense of Pollard and Sag (1994), chapter 9) if it (is present and) bears *str* case. Similarly, by structural object we mean any structural NP element of COMPS. We find these notions more intuitive than, respectively, *external argument* and *internal argument* inherited from GB and used by Heinz and Matiasek (1994). See, however, their article for some motivation for this nomenclature.

[9]Some work has been done on analysis of case dichotomy in other Slavic languages, mainly Russian. The reader is referred to Babby (1986), Franks (1986), Franks (1990), Franks (1994) and references cited therein.

[10]See a.o. Willim (1990), Polański (1993) (p. 578, entry for *vocativus*) and Strutyński (1993) for arguments for this position, but also Saloni and Świdziński (1985) p. 137 for important arguments against it.

[11]This statement, as it stands, is too strong; cf. examples like (i) (pointed to us by Bob Borsley) or (ii) (from Saloni and Świdziński (1985), p. 118) below:

(i)   *Jan,   rozmawiałem z   nim.*
        John$_{nom}$, talked$_{1st,sg}$ with him$_{ins}$.

        'John, I talked to him.'

(ii)   *Przyjaciele wołają go   Grubas.*
        Friends$_{nom}$ call   him$_{acc}$ Fat$_{nom}$.

        'The friends call him Fatty.'

2.2   Nominalization

As far as nominalization is concerned, Polish parallels German.[12] Consider the following data:

(11) a.   *Janek   pomaga   Tomkowi.*
               John$_{nom}$ helps   Tom$_{dat}$.
               'John is helping Tom.'

      b.   *pomaganie   Tomkowi*
               helping   Tom$_{dat}$
               'the help for/*from Tom'

      c.   *pomaganie   Janka*
               helping   John$_{gen}$
               'the help from/*for John'

(12) a.   *Janek   pogardza   Tomkiem*
               John$_{nom}$ scorns   Tom$_{ins}$.
               'John scorns Tom.'

      b.   *pogardzanie   Tomkiem*
               scorning   Tom$_{ins}$
               'the scorn for/*from Tom'

      c.   *pogardzanie   Janka*
               scorning   John$_{gen}$
               'the scorn from/*for John'

(13) a.   *Janek   wspiera   Marię*
               John$_{nom}$ supports Mary$_{acc}$.
               'John is supporting Mary.'

      b.   *wspieranie   Marii   (Janka)*
               helping   Mary$_{gen}$ (John$_{gen}$)
               'the help for/from Mary (John)'

Examples (11) and (12) suggest that dative and instrumental cases are here instances of lexical case: they do not change under nominalization. On the other hand, as (13) shows, accusative is structural: the case changes to genitive in the process of nominalization. Of course, nominative and genitive are also structural cases here, just like in German.

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[12]Cf. section 4.3 where we actually argue against this statement.

On the basis of the above observations we can postulate the first version of Case Principle for Polish:

Case Principle (First Version)
In a *head-complement-structure* of category
- **verb:**   the structural subject has a CASE value of *snom*,
                       the structural object has a CASE value of *sacc*,
- **noun:**   any structural argument (subject or object) has a CASE
                       value of *sgen*.

2.3   Objects of Prepositions

It should be emphasized that the foregoing remarks are not relevant for those arguments which are prepositional phrases:[13]

(14) a.   *Janek   czeka   na   Marię.*
                John$_{nom}$ waits   on   Mary$_{acc}$.
                'John is waiting for Mary.'

     b.   *czekanie   na   Marię*
                waiting   on   Mary$_{acc}$
                'the waiting for Mary'

As the above example shows, accusative NPs which are arguments of prepositions do not change their case under nominalization.

Heinz and Matiasek analyze prepositions devoid of their inherent (locational) meaning as 'markers'. For them, prepositional phrases are just 'marked' nominal phrases, i.e., NP[+marked]. Hence, Case Principle can be applied to prepositional phrases. This, in turn, means that the accusative complement in example (14) cannot be structural: if it were structural then — according to Case Principle — it would have to change into genitive in the process of nominalization.

On the basis of analogous observations for German, Heinz and Matiasek (1994) posit that prepositional (i.e., 'marked' in their terminology) arguments exhibiting accusative case are instances of lexical accusative (and exactly for this reason such 'marked' NPs do not change case under nominalization). Note that this failure of 'marked' (i.e., prepositional) arguments to change case under nominalization seems to be one of the main reasons for allowing lexical accusatives; all other (i.e., 'unmarked') occurences of accusative phrases are structural. Hence, Heinz and Matiasek miss the generalization that all 'unmarked' (i.e., true NP) accusative phrases are structural, while all 'marked' (i.e., prepositional) accusative phrases are lexical.

On our account there are no such coincidences: we do not follow Heinz and Matiasek (1994) in analyzing prepositional phrases as 'marked' nominal phrases, but rather, traditionally, as

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[13]Neither are they relevant for adverbial modifiers but here facts are less clear-cut. Unfortunately, discussion of case assignment to adverbial modifiers is outwith the scope of this paper.

true prepositional phrases. This treatment of prepositional phrases explains the failure of prepositional accusative arguments to become genitive under nominalization (cf. (14a) and (14b)) — according to the Case Principle only *nominal* structural phrases alternate with environment, not prepositional phrases.[14]

We will also postulate that accusative case is always structural in Polish. This position is a consequence of the observation that there are no verbs in Polish subcategorizing for a *stable* accusative (or rather, structural) complement; accusative complements always become genitive under nominalization (and under genitive of negation, see below).[15] Of course, since prepositional arguments can bear accusative case, and we assume (cf. page 197) that lexical items never specify the morphological case of their structural complements, we have to add one more clause to the Case Principle:

Case Principle (Second Version)
In a *head-complement-structure* of category

      ...   ...

- **noun:**   any structural argument (subject or object) has a CASE value of *sgen*,
- **preposition:** the structural object has a CASE value of *sacc*.

We invite the reader to check that thus revised Case Principle and the lexical entry for the preposition *na* given (partially) below account for the example (14).

$$(15)\quad \begin{bmatrix} word \\ \text{PHON } \langle na \rangle \\ \\ \text{SYNSEM|LOC|CAT} \begin{bmatrix} category \\ \text{HEAD} \begin{bmatrix} prep \\ \text{PFORM } `na'+str \end{bmatrix} \\ \text{SUBCAT } \langle NP[str] \rangle \end{bmatrix} \end{bmatrix}$$

The next section shows that prepositional arguments are also not affected by Genitive of Negation.

2.4 Genitive of Negation

Another phenomenon of case variation is the so-called Genitive of Negation (GoN): an accusative object of a verb appearing in a declarative sentence changes its case marking to genitive under sentential negation. This is illustrated by the following example:

(16) a.   *Janek   lubi Marię.*
                John$_{nom}$ likes Mary$_{acc}$.
                'John likes Mary.'

    b.   *Janek   **nie** lubi Marii.*
                John$_{nom}$ not likes Mary$_{gen}$.
                'John doesn't like Mary.'

---

[14]Not much else hinges on this decision, though.

[15]See section 4 for other arguments for the structurality of the accusative of prepositional arguments.

GoN does not exist in German but it is widespread in Slavic and exists also in some other languages (e.g., Finnish). GoN is a very unstable phenomenon: in many Slavic languages the accusative case expands rapidly taking the place of genitive in many constructions, not least in sentential negation. For example, in Czech GoN has practically ceased to exist; only the older generations use it in some restricted environments. In Russian, on the other hand, both accusative and genitive are allowed under sentential negation[16], while in Polish, even though accusative replaces genitive in many syntactic environments, genitive remains the only possibility under sentential negation.[17]

It is worth noticing that Genitive of Negation, just as nominalization, does not affect dative and instrumental complements. The examples below should be compared with (11)–(13) above:

(17) a.   *Janek   pomaga   Tomkowi.*
           John$_{nom}$ helps   Tom$_{dat}$.

           'John is helping Tom.'

      b.   *Janek   **nie** pomaga   Tomkowi.*
           John$_{nom}$ not helps   Tom$_{dat}$.

           'John is not helping Tom.'

(18) a.   *Janek   pogardza   Tomkiem.*
           John$_{nom}$ scorns   Tom$_{ins}$.

           'John scorns Tom.'

      b.   *Janek   **nie** pogardza   Tomkiem.*
           John$_{nom}$ not scorns   Tom$_{ins}$.

           'John doesn't scorn Tom.'

(19) a.   *Janek   wspiera   Marię.*
           John$_{nom}$ supports Mary$_{acc}$.

           'John is supporting Mary.'

      b.   *Janek   **nie** wspiera   Marii.*
           John$_{nom}$ not supports Mary$_{gen}$.

           'John is not supporting Mary.'

---

[16]The reader is referred to Timberlake (1986) for an analysis of distribution of accusative and genitive under negation and for defence of the hypothesis that GoN is in the state of withdrawal in Russian.

[17]Actually, this rule has a few exceptions. Buttler *et al.* (1971) give two conditions when accusative is allowed. The first is semantical in nature: accusative is allowed when the sentence has a positive meaning despite its apparent negation. The second, which is structural, says that accusative is allowed when the complement is "far" from the finite verb. We do not try to model these exceptions in this paper.

Also prepositional arguments are not affected by negation. Again, the examples below parallel (14):

(20) a.   *Janek   czeka   na   Marię.*
               John$_{nom}$ waits   on   Mary$_{acc}$.

               'John is waiting for Mary.'

       b.   *Janek   **nie** czeka   na   Marię.*
               John$_{nom}$ not   waits   on   Mary$_{acc}$.

               'John is not waiting for Mary.'

These data independently confirm the distinction between structural and lexical case made in the previous section.[18] They also call for splitting one of the clauses of Case Principle:

Case Principle (Third Version)
In a *head-complement-structure* of category
       ...   ...
  - **verb:**   the structural subject has a CASE value of *snom*,
  - **verb[−neg]:** the structural object has a CASE value of *sacc*,
  - **verb[+neg]:** the structural object has a CASE value of *sgen*,
       ...   ...

2.5   Case Lattice for Polish

On the basis of the above examples we are able to postulate the case type hierarchy for the Polish case system (Figure 4). In this hierarchy we arbitrarily assume that locative is an instance of the lexical case; such an assumption simplifies the Case Principle. We also assume that — just as in German — genitive can be either structural or lexical. We will present arguments for this stance in section 4.

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[18] While avoiding any specific analysis of negation here, we assume an existance of the binary attribute NEG appropiate at least for *verb*. The value of this attribute is '+' if the verb in question is in the scope of negation, or '−' otherwise. A careful account of negation is needed in order to treat examples such as (ii) below (pointed to us by Bob Borsley), where the +NEG value seems to be shared between the matrix verb and its VP[inf] complement.

(i)   *Jan   chiał   widzieć Marię.*
           John$_{nom}$ wanted see$_{inf}$ Mary$_{acc}$.

           'John wanted to see Mary.'

(ii)   *Jan   nie chciał widzieć Marii.*
           John$_{nom}$ not wanted see$_{inf}$ Mary$_{gen}$.

           'John didn't want to see Mary.'
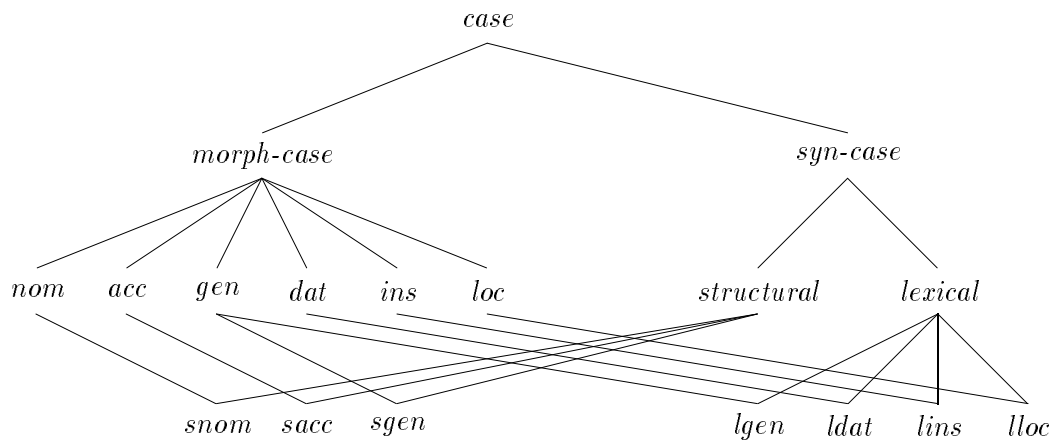
Figure 4: Case hierarchy for Polish

As we have mentioned above, a type hierarchy such as the one in figure 4 is not an inheritance hierarchy in the sense of Carpenter (1992).[19] For example, the consistent types *structural* and *morph-case* have no least upper bound. Figure 5 presents an analogous case hierarchy which is a correct inheritance hierarchy.
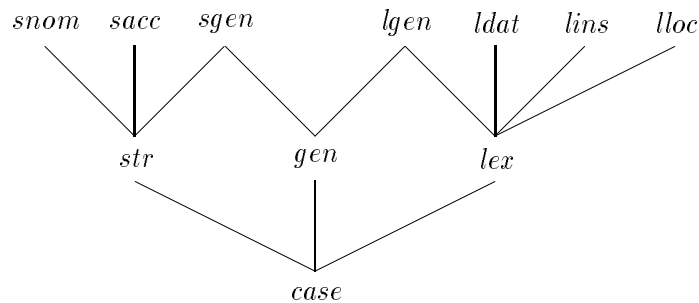
Figure 5: Correct case hierarchy for Polish

In the next sections we will try to analyze within the framework established so far some more ephemeral and idiosyncratic issues concerning case assignment in Polish, namely those of the case of numerals (section 3) and so-called indefinite numerals (section 4). We will also make a few remarks on passivization (section 5).

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[19]It is not a BCPO, see Carpenter (1992).

3   Numerals

The complexity of numerals in Slavic languages is really daunting; Polish is no exception here. In general, this complexity is thought to be caused by the transitional character of numerals in Polish.[20] We will try not to forget about these diachronic considerations in what follows. However, our account will be mainly synchronical; we will attempt to analyze the phenomena involved as they stand.[21]

3.1   Basic Facts

In this subsection, we will deal with the most typical relationship basic numerals establish with noun phrases.

3.1.1   There are no nominative numeral phrases!

3.1.1.1   Initial assumptions   Consider the declension patterns shown in (21) and (22) below. This is how such patterns should be understood: the NOM row contains these forms which can appear as subjects of typical verbs (such as *jeść*, 'eat', or *lubić*, 'like'); the ACC row contains these forms which can appear in an object position of typical transitive verbs (such as *lubić*, 'like'); the DAT row contains these forms which can appear as second objects of typical ditransitive verbs (such as *dać*, 'give'), etc. It is important to bear this point in mind as we will analyze some sentential subjects (i.e., forms appearing in the NOM row) as *accusative* phrases.[22]

(21)   Non-masculine-human declension:

	these	*five*	*women*
NOM	$te_{nom/acc}$/$tych_{gen}$	$pięć_{nom/acc}$	$kobiet_{gen}$
GEN	$tych_{gen}$	$pięciu_{gen}$	$kobiet_{gen}$
DAT	tym_{dat}	$pięciu_{dat}$	$kobietom_{dat}$
ACC	$te_{nom/acc}$/$tych_{gen}$	$pięć_{nom/acc}$	$kobiet_{gen}$
INS	$tymi_{ins}$	$pięcioma_{ins}$	$kobietami_{ins}$
LOC	$tych_{loc}$	$pięciu_{loc}$	$kobietach_{loc}$

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[20] See for example Buttler *et al.* (1971) for a short assessment of the changes the system of numerals is undergoing currently.

[21] For some analyses of numerals in other Slavonic languages the reader is referred to Corbett (1978) and Franks (1994) and references cited therein.

[22] Hence, there is no contradiction in a pattern containing the following row (cf. (29)):

(i)   NOM $tych_{gen/acc}$ $pięciu_{acc}$ $mężczyzn_{gen}$

(22)   Masculine-human declension:

	these	*five*	*men*
NOM	tych$_{gen/acc}$	pięciu$_{nom/gen/acc}$	mężczyzn$_{gen/acc}$
GEN	tych$_{gen}$	pięciu$_{gen}$	mężczyzn$_{gen}$
DAT	tym$_{dat}$	pięciu$_{dat}$	mężczyznom$_{dat}$
ACC	tych$_{gen/acc}$	pięciu$_{gen/acc}$	mężczyzn$_{gen/acc}$
INS	tymi$_{ins}$	pięcioma$_{ins}$	mężczyznami$_{ins}$
LOC	tych$_{loc}$	pięciu$_{loc}$	mężczyznach$_{loc}$

The subscripts in these patterns indicate the case values (of the nominal forms in question) which we *initially* deem possible (and relevant). Before we proceed with resolving these case ambiguities, including the crucial one in the NOM row, we have to explicate what exactly we mean by case ambiguities here. Let us start with the NOM row of the non-masculine-human declension (21). The determiner *te* is marked as ambiguous between nominative and accusative. This means that *te* can occur only with nominative or accusative nouns (i.e., only in NOM and ACC rows), e.g.:

(23) a.   *te   kobiety*
              these women$_{nom/acc}$

      b.   * *te   kobiet/kobietom/kobietami/kobietach*
              these women$_{gen/dat/ins/loc}$

Similarly, by marking *pięć* as ambiguous with respect to nominative and accusative case, we mean that it can appear only in the NOM and ACC rows of declension patterns. On the other hand, *tych* is unambiguously marked as genitive in the NOM and ACC rows; by that we indicate that it can co-occur only with genitive nouns (we arbitrarily consider the fact that it can also occur with locative nouns irrelevant here):

(24) a.   *tych   kobiet*
              these women$_{gen}$

      b.   * *tych   kobiety*
              these women$_{nom/acc}$

3.1.1.2   The analysis   Note first that in both patterns there is total and unambiguous case concord between the determiner, the numeral and the noun phrase in four cases: genitive, dative, instrumental and locative (i.e., in the lexical cases). Note also that in both declensions the nominative phrase is the same as the accusative one. This is expected as far as non-masculine-human declension is concerned, but quite surprising with respect to the masculine-human declension; in Polish, nominative and accusative cases are normally (i.e., in phrases with no numerals) different in masculine-human declension. Our account explains these facts.

The crux of our analysis concerns the case ambiguities indicated in the NOM and ACC rows of examples (21) and (22). In order to try to resolve these case ambiguities we will make the natural and non-controversial assumption that in both declension patterns the elements in corresponding slots have the same case. For example, since in the non-masculine-human

declension (21) the case of *kobiet* in the NOM and ACC rows is unambiguously genitive, we will assume that the case of *mężczyzn* in the corresponding slots of the masculine-human pattern (22) is also genitive (rather than accusative).

Unlike in (21), the numeral in masculine-human pattern (22) is ambiguous with respect to three case values: nominative, accusative and genitive. Applying the same method that we have already used above, we can establish — again, by analogy with non-masculine-human pattern — that the case values really at issue here are nominative and accusative. The considerations so far are summarized below:

(25)   Non-masculine-human declension (extract):

	these	*five*	*women*
NOM	te$_{nom/acc}$/tych$_{gen}$	pięć$_{nom/acc}$	kobiet$_{gen}$
ACC	te$_{nom/acc}$/tych$_{gen}$	pięć$_{nom/acc}$	kobiet$_{gen}$

Masculine-human declension (extract):

	these	*five*	*men*
NOM	tych$_{gen/acc}$	pięciu$_{nom/acc}$	mężczyzn$_{gen}$
ACC	tych$_{gen/acc}$	pięciu$_{nom/acc}$	mężczyzn$_{gen}$

In order to show that the numeral phrases in the NOM (and ACC) row are really *accusative*, we will concentrate on the apparent disparity between the possible determiners in both patterns. The crucial fact in the masculine-human declension pattern is that *tych* can normally choose only between genitive and accusative cases:

(26) a.   *tych   mężczyzn*
         these men$_{gen/acc}$

     b.   * *tych   mężczyźni/mężczyznom/mężczyznami/mężczyznach*
         these men$_{nom/dat/ins/loc}$

Note first that the non-masculine-human declension allows any of the two determiners *te$_{nom/acc}$* (which agrees with the numeral *pięć$_{nom/acc}$*) and *tych$_{gen}$* (which agrees with the noun *kobiet$_{gen}$*). In fact, *te* cannot be nominative; if it were nominative, then analougous (but masculine) nominative determiner should be also allowed in the masculine-human declension pattern. As the judgement below shows, this is definitely not the case:

(27)   * *ci   pięciu   mężczyzn*
         these$_{nom}$ five   men

This means that, since *te* cannot be nominative, it has to be accusative. But if it is accusative, the numeral it agrees with also has to be accusative; in Polish determiners always agree (with respect to case) with the phrases they modify. So, the NOM and ACC rows of the non-masculine-human declension pattern finally look as follows:

(28)   Non-masculine-human declension (extract):

	these	*five*	*women*
NOM	te$_{acc}$/tych$_{gen}$	pięć$_{acc}$	kobiet$_{gen}$
ACC	te$_{acc}$/tych$_{gen}$	pięć$_{acc}$	kobiet$_{gen}$

But this, in turn, means that the numeral in the masculine-human declension also has to be accusative:

(29)   Masculine-human declension (extract):

	these	*five*	*men*
NOM	tych$_{gen/acc}$	pięciu$_{acc}$	mężczyzn$_{gen}$
ACC	tych$_{gen/acc}$	pięciu$_{acc}$	mężczyzn$_{gen}$

Note that the foregoing analysis has been conducted outside any specific linguistic theory and without any assumption as to the real structure of the nominal phrases as the ones above; i.e., we have not commited ourselves to any decision on what constitutes head of such phrases: it might be either a numeral (*pięciu*), or a noun phrase (*mężczyzn*). So far any analysis seems plausible, as far as we postulate a linear precedence (LP) rule stating that in (Polish) numeral phrases determiners precede numerals which, in turn, precede noun phrases. This LP rule, when applied to *pięć tych$_{gen}$ kobiet$_{gen}$* gives *tych$_{gen}$ pięć kobiet$_{gen}$*.

However, now we commit ourselves to a particular analysis of numeral phrases: we will analyze them as *true* numeral phrases, i.e., headed by a numeral. This stance is consistent not only with the rows corresponding to lexical cases (GEN, DAT, INS and LOC), but also with the ones for ACC; indeed, if we analyzed such phrases as headed by a noun, we would have to explain why an accusative phrase is headed by a genitive noun. The ensuing sections will provide us with more arguments for such analysis of numeral phrases.[23]

The most important conclusion of the foregoing discussion is this: numeral phrases in sentential positions cannot be nominative. Moreover, since they are headed by a numeral (and we have established that the case of the numeral in NOM row is accusative), such phrases have to bear the accusative case.[24] This conclusion explains a number of facts, e.g., the same form of masculine-human numeral phrases in the NOM and ACC rows: nominative and accusative numeral phrases are the same because... there are no nominative numeral phrases! It is the *accusative* numeral phrases that fill the sentential subject positions. However, the most striking conclusion concerns the agreement pattern between numeral phrases in the subject position and the verb.

3.1.2   Numeral subject-verb agreement

The article Czuba and Przepiórkowski (1995) presents a parochial grammatical principle (called Subject-Verb Agreement Principle) which describes agreement patterns between the verb and its subject in Polish. In short, this principle says that if the subject is a nominative nominal phrase then 'full' agreement of gender, number and person takes place, while in all other instances the verb takes *neuter*, *singular* and *third* as values of the respective grammatical categories. These 'other instances' are for example: lack of subject (i.e., empty SUBJECT list), e.g., in the case of meteorological verbs (*mżyć*, 'drizzle'); sentential subject,[25]

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[23]See also Saloni and Świdziński (1985) for other arguments for this position.

[24]It has to be emphasized that this is a very unorthodox result, although it has been signalled a.o. by Zabludowski (1989) and Franks (1994). The traditional grammarians analyze numeral phrases in subject position as headed by a genitive noun (cf. Klemensiewicz (1986), p. 121), while the formal Polish grammar Saloni and Świdziński (1985) analyzes them as headed by a nominative numeral.

[25]See Świdziński (1993) and Przepiórkowski (1994).

as required e.g. by *dziwi*, 'makes one wonder'; and nominal subjects with case values different from nominative (it might be argued that verbs such as *ubywać*, 'wane', subcategorize for such subjects).

Being in the possession of this strongly-motivated principle, we do not have to posit any new mechanisms in order to explain the fact that numeral phrases in the subject position also trigger such a 'reduced' agreement pattern:

(30) a.   *Dwóch facetów jadło   jabłko.*
            Two   guys   eat$_{3rd,sing,neut,past}$ apple.

            'Two guys were eating an apple.'

      b.   *Pięć kobiet poszło   do kina.*
            Five   women go$_{3rd,sing,neut,past}$ to   cinema.

            'Five women went to the cinema.'

Now, in view of our theory of agreement, the 3rd person singular neuter marking on the verb follows from the fact that the numeral phrase (in the examples above: *dwóch facetów* and *pięć kobiet*) is not nominative, and hence invokes the 3rd person singular neuter values of respective categories of the verb.

3.1.3   What are numerals?

The natural question that arises here is why numeral phrases have such heterogeneous declension patterns. In order to answer this question we will first of all posit that — syntactically speaking — numerals are nouns, i.e., numeral phrases are really noun phrases.[26] This position has two practical advantages over any other analyses of numerals: lexical items do not have to subcategorize separately for noun phrases and numeral phrases, and — more importantly — numeral phrases are in the scope of Case Principle (as far as they are structural). Our modelling of numerals in terms of HPSG *sign*s will be based on the observation that there is no case agreement between the numeral and the NP it subcategorizes for only in NOM and ACC rows (cf. (21) and (22)), i.e., exactly in these cases which have to be structural (i.e., which do not have lexical counterparts; cf. case lattice for Polish (4) on page 205).

This observation leads us to the conclusion that there are two kinds of numerals, or rather that each numeral has to have two entries in the lexicon, one with lexical and one with structural case. This is exemplified below:[27]

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[26] As far as morphological (esp. inflectional) properties are concerned numerals constitute a separate class, cf. Saloni and Świdziński (1985).

[27] Notice that the PHON feature is a function of STEM and AGR; we follow here Kathol (1995).

(31) a.

$$
\begin{bmatrix}
word \\
\text{PHON } PF(\boxed{1},\boxed{2}) \\
\text{STEM } | \text{ PHON } \boxed{2}\langle pi\c{e}\acute{c}\rangle \\[2ex]
\text{SYNSEM } | \text{ LOC } | \text{ CAT }
\begin{bmatrix}
cat \\
\text{HEAD }
\begin{bmatrix}
nom \\
\text{NUMERAL } + \\
\text{AGR } \boxed{1}\begin{bmatrix}\text{CASE } \boxed{3}\,lex\end{bmatrix}
\end{bmatrix} \\
\text{COMPS } \langle NP[\text{AGR } | \text{ CASE } \boxed{3}\,]\rangle
\end{bmatrix}
\end{bmatrix}
$$

b.

$$
\begin{bmatrix}
word \\
\text{PHON } PF(\boxed{1},\boxed{2}) \\
\text{STEM } | \text{ PHON } \boxed{2}\langle pi\c{e}\acute{c}\rangle \\[2ex]
\text{SYNSEM } | \text{ LOC } | \text{ CAT }
\begin{bmatrix}
cat \\
\text{HEAD }
\begin{bmatrix}
nom \\
\text{NUMERAL } + \\
\text{AGR } \boxed{1}\begin{bmatrix}\text{CASE } str\end{bmatrix}
\end{bmatrix} \\
\text{COMPS } \langle NP[\text{AGR } | \text{ CASE } gen]\rangle
\end{bmatrix}
\end{bmatrix}
$$

Note that in our account numerals are simply nouns with their NUMERAL feature (appropriate for type *noun*) set to '+'. (All other nouns are specified as −NUMERAL.) Note also that in fact one lexical entry for each numeral will suffice in the lexicon in the technical sense as a simple lexical rule can be used to derive the other — this way we will be able to express the systematic relation between the two signs in (31). These signs will receive morphological case when combined with other words: lexical numerals will receive their case from the subcategorizing element via Subcat Principle, while structural numerals will get it via Case Principle.[28] Of course, Case Principle cannot remain as it is now or it would require nominative numeral phrases (which do not exist!) in the sentential subject position. Numeral phrases (and *only* numeral phrases) in subject positions are accusative, so the Case Principle has to depend on the feature NUMERAL. The revised version of this principle is shown below:

Case Principle (Penultimate Version)
In a *head-complement-structure* of category
- **verb**:   the structural subject has a CASE value of *snom* if −NUMERAL or *sacc* if +NUMERAL,
- **verb[−neg]**:   the structural object has a CASE value of *sacc*,
- **verb[+neg]**:   the structural object has a CASE value of *sgen*,
- **preposition**:   the structural object has a CASE value of *sacc*,
- **noun**:   any structural argument has a CASE value of *sgen*.

These are the only saturated or almost saturated *head-complement-structures* with structural arguments.

3.1.4   An Example

The above results will be illustrated here with the analysis of an example sentence (32):

---

[28] We hope that the reader will not be deceived by the 'transformational' language that we use here to describe 'declarative' constraints.

(32)   *Pięciu facetów zarządzało   siedmioma firmami.*
        Five$_{acc}$ guys$_{gen}$ manage$_{neut,3rd,sing,past}$ seven$_{ins}$ companies$_{ins}$.
        'Five guys managed seven companies.'

The head of this phrase is the verb *zarządzało* which subcategorizes for a structural nominal subject and an instrumental object:

(33)   zarządzało: $\langle$NP[*str*], NP[*lins*]$\rangle$

Since the phrase *pięciu facetów* is structural, its head, *pięciu*, is — according to the Head Feature Principle — also structural. This means that it has to satisfy the description (31b) on page 210 and subcategorize for a genitive NP. This is indeed so: *facetów* bears the genitive case. Moreover, since *pięciu* is the head of the subject, +NUMERAL, and *str*, the subject itself is also +NUMERAL and structural. Now Case Principle comes into action and requires the subject to bear accusative case. This in turn, via Subject-Verb Agreement Principle, triggers the reduced agreement pattern which results in the neuter third singular values of the respective categories of the verb form *zarządzało*.

The second argument of the verb is the instrumental object *siedmioma firmami*. The case value of this numeral phrase is lexical, so its head, *siedmioma*, has to satisfy description (31a) above. But this in turn means that the numeral and the nominal phrase it subcategorizes for have to agree in case. Hence, the instrumental case value of *firmami*.

3.2   More Facts

The previous section describes the behaviour of numerals from *pięć* ('five') onwards (with exceptions, see below). Numerals *dwa* ('two') to *cztery* ('four') behave in Polish in a slightly different way; they adhere to the usual declension patterns and always agree with the noun phrases they govern:

(34)   Non-masculine-human declension:

	these	*three*	*women*
NOM	te$_{nom/acc}$	trzy$_{nom/acc}$	kobiety$_{nom/acc}$
GEN	tych$_{gen}$	trzech$_{gen}$	kobiet$_{gen}$
DAT	tym$_{dat}$	trzem$_{dat}$	kobietom$_{dat}$
ACC	te$_{nom/acc}$	trzy$_{nom/acc}$	kobiety$_{nom/acc}$
INS	tymi$_{ins}$	trzema$_{ins}$	kobietami$_{ins}$
LOC	tych$_{loc}$	trzech$_{loc}$	kobietach$_{loc}$

(35)   Masculine-human declension:

	these	*three*	*men*
NOM	ci$_{nom}$	trzej$_{nom}$	mężczyzni$_{nom}$
GEN	tych$_{gen/acc}$	trzech$_{gen/acc}$	mężczyzn$_{gen/acc}$
DAT	tym$_{dat}$	trzem$_{dat}$	mężczyznom$_{dat}$
ACC	tych$_{gen/acc}$	trzech$_{gen/acc}$	mężczyzn$_{gen/acc}$
INS	tymi$_{ins}$	trzema$_{ins}$	mężczyznami$_{ins}$
LOC	tych$_{loc}$	trzech$_{loc}$	mężczyznach$_{loc}$

Considerations similar to those above lead us to the conclusion that these numerals behave like nouns as far as declension patterns are concerned. In particular, they can bear the nominative case, and the NOM and ACC rows in masculine-human declension (35) differ. Hence, we will analyze them as 'normal' (i.e., $-$NUMERAL) nouns:

$$
(36) \quad
\begin{bmatrix}
word \\
\text{PHON } PF(\boxed{1},\boxed{2}) \\
\text{STEM } | \text{ PHON } \boxed{2}\langle trzy \rangle \\
\\
\text{SYNSEM } | \text{ LOC } | \text{ CAT }
\begin{bmatrix}
cat \\
\text{HEAD }
\begin{bmatrix}
nom \\
\text{NUMERAL } - \\
\text{AGR } \boxed{1}
\end{bmatrix} \\
\text{COMPS } \langle NP[\text{AGR } \boxed{1}]\rangle
\end{bmatrix}
\end{bmatrix}
$$

In fact (cf. Buttler *et al.* (1971)), there is a tendency in modern Polish to adopt a uniform system of numerals. One of the symptoms of these changes is the behaviour of numerals *dwa* ('two') to *cztery* ('four'). Apart from the declension patterns (34) and (35) shown above, these numerals have an alternative masculine-human declension which parallels that of other numerals (such as *pięć*, cf. (22)):

(37)   Masculine-human declension:

	these	*three*	*men*
NOM	tych$_{gen/acc}$	trzech$_{acc}$	mężczyzn$_{gen}$
GEN	tych$_{gen}$	trzech$_{gen}$	mężczyzn$_{gen}$
DAT	tym$_{dat}$	trzem$_{dat}$	mężczyznom$_{dat}$
ACC	tych$_{gen/acc}$	trzech$_{acc}$	mężczyzn$_{gen}$
INS	tymi$_{ins}$	trzema$_{ins}$	mężczyznami$_{ins}$
LOC	tych$_{loc}$	trzech$_{loc}$	mężczyznach$_{loc}$

As Buttler *et al.* (1971) claim (p. 343), there is a rapid shift in the contemporary Polish towards the usage of the latter form of the masculine-human declension patterns. That is, in terms of our *sign* feature structures, there is a rapid expansion of lexical entries such as (31).

One more example of this tendency is given by the numerals such as *tysiąc* ('thousand'), *milion* ('million'), etc. Traditionally, they are analyzed as nouns which always assign genitive case to their NP complements:

		thousand	*men*	(*women*)
	NOM	tysiąc$_{nom/acc}$	mężczyzn$_{gen}$	(kobiet$_{gen}$)
	GEN	tysiąca$_{gen}$	mężczyzn$_{gen}$	(kobiet$_{gen}$)
(38)	DAT	tysiącu$_{dat}$	mężczyzn$_{gen}$	(kobiet$_{gen}$)
	ACC	tysiąc$_{nom/acc}$	mężczyzn$_{gen}$	(kobiet$_{gen}$)
	INS	tysiącem$_{ins}$	mężczyzn$_{gen}$	(kobiet$_{gen}$)
	LOC	tysiącu$_{loc}$	mężczyzn$_{gen}$	(kobiet$_{gen}$)

The reader will immediately notice that numeral phrases involving *tysiąc*, etc. crucially have to be analyzed as true numeral phrases headed by *tysiąc*: the case of the whole phrase is

the same as the case of the numeral, while the subcategorized NP is always genitive. This provides us with one more argument, an argument of uniformity, for analyzing numerals in *all* numeral phrases as heads.

Notice also that *tysiąc* cannot be analyzed here just as a $-$NUMERAL noun for the reasons we give presently. In Polish *tysiąc* has the masculine gender. If, when in sentential subject position, it were really just a normal (i.e., $-$NUMERAL) nominative noun, it would take part in gender agreement with the past tense verb as all other nominative nouns do. This is, however, not the case:

(39) a.   *Tysiąc*   *mężczyzn poszło*   *do pracy.*
            One thousand$_{nom/acc,\text{masc}}$ men   went$_{3rd,sing,\text{neut}}$ to work.

            'One thousand men went to work.'

      b.   * *Tysiąc*   *mężczyzn poszedł*   *do pracy.*
            One thousand$_{nom/acc,\text{masc}}$ men   went$_{3rd,sing,\text{masc}}$ to work.

            'One thousand men went to work.'

This[29] strongly suggests that the noun (numeral) phrase *tysiąc mężczyzn* is not assigned nominative case. But this fits well in the picture drawn so far: we will posit that *tysiąc*, *milion*, etc. are $+$NUMERAL nouns which combine with genitive (plural) NPs but which are not themselves specified for case:

(40)
$$
\begin{bmatrix}
\textit{word} \\
\text{PHON } PF(\boxed{1},\boxed{2}) \\
\text{STEM} \mid \text{PHON } \boxed{2}\langle \textit{tysiąc} \rangle \\[4pt]
\text{SYNSEM} \mid \text{LOC} \mid \text{CAT}
\begin{bmatrix}
\textit{cat} \\
\text{HEAD}
\begin{bmatrix}
\textit{nom} \\
\text{NUMERAL } + \\
\text{AGR } \boxed{1}
\end{bmatrix} \\
\text{COMPS } \langle NP[\text{AGR} \mid \text{CASE } \textit{gen}]\rangle
\end{bmatrix}
\end{bmatrix}
$$

Notice, that phrases headed by this sign can appear both in environments requiring lexical case and in those requiring structural case.[30] As usual, in the former instance case values will be assigned by a lexical element, while in the latter — by the Case Principle. In particular, numeral phrases in subject position headed by *tysiąc*, being $+$NUMERAL and not specified for the CASE value (i.e., potentially structural), will be assigned the structural accusative case and, hence, trigger the 3rd person singular neuter agreement pattern on the verb as predicted by the analysis of agreement in Czuba and Przepiórkowski (1995). This explains the ungrammaticality of (39b) where the verb *poszedł* is marked as masculine.

---

[29]Some speakers find (39b) also acceptable. This suggests that their lexical entries for *tysiąc* are ambiguous with respect to the NUMERAL feature.

[30]Actually, in this respect *tysąc* behaves like a 'normal' ($-$NUMERAL) noun.

3.3 Collective Numerals

There is one more kind of numerals that we have said nothing about: the so-called collective numerals.[31] This is a group of numerals used with noun phrases describing people of mixed sex (e.g., *pięcioro studentów*, 'five students (of mixed sex)'), children (*czworo dzieci*, 'four children'), small animals (*troje kurcząt*, 'three chickens'), and with some *plurale tantum* nouns (*pięcioro drzwi*, 'five doors'). However, as these numerals are to some extent redundant and their declension is very ill-behaved (see below), the 'regular' numerals take over in contemporary Polish.[32] Thus, in the examples below, the (b) form, although still not sanctioned by the linguistic norm, becomes more and more widespread:[33]

(41) a.   *W klasie było   dwadzieścioro dzieci.*
        In   class   were$_{3rd,sing,neut}$ twenty$_{coll,acc}$ children$_{gen}$.
        'There were twenty children in the class.'

     b.   *W klasie było   dwadzieścia dzieci.*
        In   class   were$_{3rd,sing,neut}$ twenty$_{reg,acc}$ children$_{gen}$.
        'There were twenty children in the class.'

(42) a.   *Zapukał   do pięciorga drzwi.*
        Knocked$_{3rd,sing,masc}$ to   five$_{coll,gen}$ doors$_{gen}$.
        'He knocked at five doors.'

     b.   *Zapukał   do pięciu   drzwi.*
        Knocked$_{3rd,sing,masc}$ to   five$_{reg,gen}$ doors$_{gen}$.
        'He knocked at five doors.'

Simultaneously, apart from this quantitative change, collective numerals undergo another, qualitative change in declension pattern. Consider first the current declension pattern of these numerals:

		five	*children*
	NOM	pięcioro$_{acc}$	dzieci$_{gen}$
	GEN	pięciorga$_{gen}$	dzieci$_{gen}$
(43)	DAT	pięciorgu$_{dat}$	dzieciom$_{dat}$
	ACC	pięcioro$_{acc}$	dzieci$_{gen}$
	INS	pięciorgiem$_{ins}$	dzieci$_{gen}$/*dziećmi$_{ins}$
	LOC	pięciorgu$_{loc}$	dzieciach$_{loc}$

---

[31] In this section we will draw heavily on obervations made by Buttler *et al.* (1971).

[32] They have already taken over to a large extent: collective numerals were used with any noun phrases once.

[33] These examples are taken from Buttler *et al.* (1971), p. 30. They also note that the supersession of collective numerals by regular numerals becomes visible in the lingusitic norm which allows both following constructions:

(i)   *W przedszkolu jest   trzydzieścioro/trzydzieści czworo   dzieci.*
       In   kindergarten is$_{3rd,sing}$ thirty$_{coll/reg,acc}$ four$_{coll,acc}$ children$_{gen}$.
       'There are thirty four children in the kindergarten.'

Notice that this pattern differs from that of 'regular' numerals (cf. (21) and (22)) in the INS row: the numeral requires a genitive (rather than instrumental) noun phrase here. Apparently, this awkward behaviour of collective numerals is caused by their transitional status from the 'agreeing' pattern[34] (like that of regular numerals, e.g., *pięć*) to the 'governing' pattern (like that of *tysiąc*). The existence of this process is confirmed by the fact that a steady shift towards the regular governing pattern (especially in locative) can be observed in contemporary Polish.[35]

Of course, these diachronic considerations do not relieve us from the duty of modelling the current state of the language. Thus, on the basis of the foregoing discussion, we will posit the following lexical entries for collective numerals:

(44) a.

$$
\begin{bmatrix}
word \\
\text{PHON } PF(\boxed{1},\boxed{2}) \\
\text{STEM} \mid \text{PHON } \boxed{2}\langle \textit{pięcioro} \rangle \\
\text{SYNSEM} \mid \text{LOC} \mid \text{CAT} \begin{bmatrix}
cat \\
\text{HEAD} \begin{bmatrix}
nom \\
\text{NUMERAL } + \\
\text{AGR } \boxed{1} \begin{bmatrix} \text{CASE } \boxed{3} \textit{lex} \wedge \neg \textit{lins} \end{bmatrix}
\end{bmatrix} \\
\text{COMPS } \langle NP[\text{AGR}|\text{CASE } \boxed{3}] \rangle
\end{bmatrix}
\end{bmatrix}
$$

b.

$$
\begin{bmatrix}
word \\
\text{PHON } PF(\boxed{1},\boxed{2}) \\
\text{STEM} \mid \text{PHON } \boxed{2}\langle \textit{pięcioro} \rangle \\
\text{SYNSEM} \mid \text{LOC} \mid \text{CAT} \begin{bmatrix}
cat \\
\text{HEAD} \begin{bmatrix}
nom \\
\text{NUMERAL } + \\
\text{AGR } \boxed{1} \begin{bmatrix} \text{CASE } \textit{str} \vee \textit{lins} \end{bmatrix}
\end{bmatrix} \\
\text{COMPS } \langle NP[\text{AGR} \mid \text{CASE } \textit{gen}] \rangle
\end{bmatrix}
\end{bmatrix}
$$

These feature structures differ from those for 'regular' numerals (cf. (31)) minimally; the only difference is slightly more complex values of AGR|CASE feature in (44).

4   Indefinite Numerals

4.1   The Analysis

In this section we will show that the vast majority of the so-called indefinite numerals patterns the numerals described in the previous section. We will also present an intriguing puzzle, the highly idiosyncratic behaviour of an indefinite numeral *dużo* ('a lot of'), and argue that this idiosyncrasy confirms the account of case in Polish given so far in a striking way.

---

[34] Of course, the numeral 'agrees' with the noun phrase only in lexical cases, while it 'governs' it (i.e., requires genitive case) in structural cases.

[35] The interesting question is what rules — if, indeed, any — govern the changes described above, that is, why the transition from 'agreeing' to 'governing' valency of collective numerals started in instrumental case, why the transition from Genitive of Negation to the lack of it in Russian takes place as described in Timberlake (1986), etc. These matters are, of course, well outwith the scope of this work.

Morphologically, indefinite numerals constitute a very heterogeneous class. They are traditionally (cf. Buttler *et al.* (1971), pp. 341–343) divided into pronominal numerals (*tyle*, *ile*, etc.), adjectival numerals (*dużo*, *wiele*) and nominal numerals (*szereg*, *część*), but this will not concern us here. What is important for us is their valency. From this point of view we can split indefinite numerals into three classes:

CLASS 1 Indefinite numerals which parallel 'ordinary' numerals (such as *pięć*, 'five'). These are mainly pronominal numerals and some adjectival numerals, e.g., *wiele* ('many'), *kilka* ('a few'), *ile* ('how many'), *tyle* ('that many'), *parę* ('a couple'), etc. Their lexical entries will be almost identical with those of 'ordinary' numerals (see declension patterns (21)–(22) and feature structures (31)).

CLASS 2 Indefinite numerals which behave like *tysiąc*, *milion*, etc. (See declension patterns (38) and feature structure (40).) These are mainly nominal numerals such as *mnóstwo*, *mnogość* ('lots of'), *szereg* ('series'), *część* ('part of'), etc.

Due to the common (in Polish) phenomenon of numeralization, CLASS 2 is currently the most actively expanding group of numerals. Numeralization is the process of transforming nouns into numerals. As we noted above, numerals (apart from 1–4) do not bear nominative case; instead the Case Principle assigns structural accusative case to those which function as sentential subjects. This, in turn, triggers the 3rd person singular neutral agreement pattern rather than the usual subject-verb agreement pattern. Hence, in practice, numeralization can be witnessed when what used to be a nominal phrase co-occurs with 3rd person singular neuter verb. Examples of nouns that seem to be undergoing the process currently are (cf. Buttler *et al.* (1971), p. 347) *szereg* ('series'), *moc* ('plenty'), *część* ('part of'). The usage is shifting from patterns such as (45a) towards (45b).

(45) a.   *Szereg*   *osób*   *wiedział*   *o*   *tym.*
            Series$_{nom/acc,sing,}$masc people$_{gen}$ knew$_{3rd,sing,}$masc about this.
            'A series of people knew about this.'

      b.   *Szereg*   *osób*   *wiedziało*   *o*   *tym.*
            Series$_{nom/acc,sing,}$masc people$_{gen}$ knew$_{3rd,sing,}$neut about this.
            'A series of people knew about this.'

Of course, in terms of our feature structure numeralization is simply a change of value of NUMERAL from '−' to '+'. We do not have much to say about lexical entries of CLASS 2 indefinite numerals as they closely match that of *tysiąc* (cf. (40)).[36]

The most interesting class of indefinite numerals is, however, CLASS 3:

CLASS 3 Indefinite numerals which are traditionally analyzed as having only nominative and accusative forms (cf. Doroszewski (1980)), e.g., *dużo* ('a lot'), *mało* ('little'), *trochę* ('a little'), *sporo* ('quite a lot'), etc.

---

[36] It is perhaps worth noting here that the same behaviour is also exhibited by the so-called fractional numerals (*półtora*, 'one and a half', *dwie trzecie*, 'two thirds', etc.) and, to some extent, collective numerals (see section 3.3). Again, these numerals have to be analyzed as heads of the nominal phrases they occur in.

Numerals such as *dużo* ('a lot') do not decline, they always have the same nominative/accusative form and always combine with genitive NPs. Below we present the defective declension pattern for *dużo*:[37]

		a lot of	*men*	(*women*)
	NOM	dużo$_{acc}$	mężczyzn$_{gen}$	(kobiet$_{gen}$)
	GEN	—	—	—
(46)	DAT	—	—	—
	ACC	dużo$_{acc}$	mężczyzn$_{gen}$	(kobiet$_{gen}$)
	INS	—	—	—
	LOC	—	—	—

The puzzle concerning these numerals is that they are grammatical in some positions which normally require genitive case, but not in others:

(47) a.   *Nie mam   w domu (zbyt) dużo   chleba.*
        Not have$_{1st,sing}$ in home (too) a lot of$_{nom/acc}$ bread$_{gen}$.
        'I don't have (too) much bread at home.'

    b.   *Nie mam   w domu chleba.*
        Not have$_{1st,sing}$ in home bread$_{gen}$.
        'I don't have bread at home.'

    c.   * *Nie mam   w domu chleb.*
        Not have$_{1st,sing}$ in home bread$_{acc}$.
        'I don't have bread at home.'

(48) a.   *Nie lubię   dużo   osób.*
        Not like$_{1st,sing}$ a lot of$_{nom/acc}$ people$_{gen}$.
        'I don't like a lot of people.'

    b.   *Nie lubię   tych   osób.*
        Not like$_{1st,sing}$ these$_{gen}$ people$_{gen}$.
        'I don't like these people.'

    c.   * *Nie lubię   te   osoby.*
        Not like$_{1st,sing}$ these$_{acc}$ people$_{gen}$.
        'I don't like these people.'

(49) a.   * *Boję   się dużo   osób.*
        Fear$_{1st,sing}$ REFL a lot of$_{nom/acc}$ people$_{gen}$.
        'I am afraid of a lot of people.'

---

[37] *Dużo*-phrases, when subjects of sentences, always trigger the 3rd person singular neuter agreement patters. This means, that just as other numeral phrases, they should be analyzed as accusative, rather then nominative, phrases.

b. *Boję się tych osób.*
   Fear$_{1st,sing}$ REFL these$_{gen}$ people$_{gen}$.
   'I am afraid of these people.'

c. * *Boję się te   osoby.*
   Fear$_{1st,sing}$ REFL these$_{nom/acc}$ people$_{nom/acc}$.
   'I am afraid of these people.'

In the examples above, the (b) and (c) sentences show that a genitive NP is required by *nie mam* ('I don't have'), *nie lubię* ('I don't like') and *boję się* ('I am afraid') (see (b)), and that it cannot be realized by an accusative phrase (see (c)). However, in (47a) and (48a) *dużo*-phrases are allowed, while in (49a) they are not.[38]

The careful reader will have noticed that these examples themselves suggest an answer to the quandary: *dużo*-phrases are allowed under the Genitive of Negation, but not as a genitive complement of a verb.[39] This, and the underlying assumption we made implicitly, namely that verbs requiring genitive complements specify them as *lexical* genitive, suggests that the indefinite numerals of CLASS 3 can only be assigned structural case, never lexical. Thus, the ungrammaticality of (49a) stems from the fact that *boję się* subcategorizes for a lexical genitive phrases (which cannot be realized by *dużo*-phrases), while the grammaticality of (47a) and (48a) is a consequence of the fact, that *mieć* ('have') and *lubić* ('like') require a structural complement (which can be realized by *dużo*-phrases).

These considerations lead us to postulating the following lexical entry for *dużo*:

$$
(50) \quad
\begin{bmatrix}
word \\
\text{PHON } \langle dużo \rangle \\[2pt]
\text{SYNSEM} \mid \text{LOC} \mid \text{CAT}
\begin{bmatrix}
cat \\[2pt]
\text{HEAD}
\begin{bmatrix}
nom \\
\text{NUMERAL } + \\
\text{AGR} \mid \text{CASE } str
\end{bmatrix} \\[4pt]
\text{COMPS } \langle NP[\text{AGR} \mid \text{CASE } gen] \rangle
\end{bmatrix}
\end{bmatrix}
$$

Notice that the interaction of the Case Principle, agreement patterns, and simple lexical entries accounts in a very elegant way for the quirky behaviour of CLASS 3 indefinite numerals. Being +NUMERAL, structural and nominal, these indefinite numerals get (via the Case Principle) accusative case (*sacc*) when in sentential subject position. As they bear a case different from nominative, they trigger the 3rd person singular neuter agreement pattern. This in turn means that the verb has the 3rd person singular neuter agreement features:

(51) *Dużo osób poszło do domu.*
   A lot of$_{acc}$ people$_{gen}$ went$_{3rd,sing,neut}$ to home.

   'A lot of people went home.'

---

[38] Actually, some speakers feel uncomfortable with (48a), but they always deem it more grammatical than (49a).

[39] Saloni and Świdziński (1985) seem to simplify things suggesting (p. 83) that *dużo*-phrases are allowed with verbs and disallowed as complements of nouns: examples like (49a) are clearly ungrammatical for all the native speakers we have consulted.

4.2   Some Ramifications

Our analysis of *dużo* supports many of the decisions we have taken in the previous sections. In this subsection we will point out two of them: the analysis of numeral phrases as headed by a numeral (see p. 209), and the analysis of accusative complements of prepositions as structural (see section 2.3, p. 201). We will start with the latter.

The crucial observation that we will employ here is that *dużo*-phrases are specified as bearing an arbitrary structural case, but *only* structural case. This analysis has allowed us to explain the extremely idiosyncratic behaviour of *dużo*-phrases, esp. the fact that these phrases seem to be allowed in some genitive environments, while disallowed in others. In other words, we have found ourselves in possession of a convenient test for checking structurality of any given environment.

This test confirms our analysis of accusative prepositional arguments:

(52) a.   *Maria   czeka   na   dużo   osób.*
             Mary   waits   on   a lot of people.

             'Mary is waiting for a lot of people.'

       b.   *Janek   przejeżdżał   przez   dużo   wsi   i   miasteczek.*
              John   went   through a lot of villages and towns.

              'John went through a lot of villages and towns.

On the other hand, if we analyzed prepositions as markers, we would have two options. One would be to assume that all 'marked' nominal phrases are lexical (cf. Heinz and Matiasek (1994)), but this would contradict the judgements above (because *dużo*-phrases are structural). The other would be to allow structural 'marked' phrases, but then we would have to add several clauses for 'marked' nominal phrases to the Case Principle (each corresponding to a different category of *head-complement-structure*: verb, noun, etc.). By contrast, our analysis allows us to add just one clause to the Case Principle (that for prepositions) and to get rid of lexical accusative altogether.

The other point we want to emphasize here is more fundamental. We have already given several arguments for analyzing numeral phrases as *true* numeral phrases, i.e., as phrases headed by a numeral. Our analysis of *dużo*-phrases provides us with one more, essentialy an argument of uniformity (similar to the one mentioned in section 3.2). It is crucial that in phrases such as *dużo osób* ('a lot of people') it is the numeral that heads the phrase. If it were the genitive noun (*osób*), then it would be very difficult to account for the following judgements:

(53) a.   * *Boję   się   dużo   osób.*
              Fear$_{1st,sing}$ REFL a lot of$_{nom/acc}$ people$_{gen}$.

              'I am afraid of a lot of people.'

b.   *Boję   się   wielu   osób.*
         Fear$_{1st,sing}$ REFL a lot of$_{gen}$ people$_{gen}$.
         'I am afraid of a lot of people.'

c.   *Boję   się   tych   osób.*
         Fear$_{1st,sing}$ REFL these$_{gen}$ people$_{gen}$.
         'I am afraid of these people.'

If *osób* were to be the head here, then, in order to explain the ungrammaticality of (53a) and the grammaticality of (53b) and (53c), we would have to postulate that *bać się* subcategorizes for a genitive NP *not* modified by any indefinite numerals of CLASS 3 (cf. (53a)) but possibly modified by some other numeral (cf. (53b)), or not modified at all (cf. (53c)); a highly *ad hoc* explanation to give. On the other hand, upon our account the NP *dużo osób* is headed by the numeral[40] whose case is specified simply as *str*. This means that the case value of the whole NP is *str* (by the Head Feature Principle), and, thus, it cannot fulfill syntactic requirements of the verb *bać się* subcategorizing for a lexical NP (specifically, for NP[CASE *lgen*]). On the other hand, the indefinite numerals *wielu* and *tych* behave like most numerals and can bear either lexical (as in the examples above) or structural case.

4.3   Nominalization Revisited

In section 2.2 we have stated that "Polish parallels German" as far as nominalization is concerned. Now, in view of some foregoing results, we will have to change our view on the matter.

We will again apply the test on structurality of a given environment provided by *dużo*-phrases, this time to investigate complements of nominalized verbs. We illustrate our considerations with the transitive verb *zjeść* ('eat').

(54)   *Janek   zjadł dużo   rodzynek.*
         John$_{nom}$ ate   a lot of raisins$_{gen}$.
         'John has eaten a lot of raisins.'

(55)   *Janek   **nie** zjadł dużo   rodzynek.*
         John$_{nom}$ not ate   a lot of raisins$_{gen}$.
         'John has not eaten a lot of raisins.'

The above examples show that the object of the verb is structural and — just as predicted by the Case Principle and the lexical entry for *dużo* (cf. (50)) — *dużo rodzynek* is allowed as an object.

However, judgements such as the one below seem to contradict the Case Principle:

(56)   * *Zjedzenie dużo   rodzynek przez Janka mogło   mu   zaszkodzić.*
         Eating   a lot of raisins   by   John   might have he$_{dat}$ harm.
         'John's eating many raisins might have harmed him.'

---

[40]Remember that numerals *are* nouns!

The unacceptability of the above sentence cannot be a matter of semantic restrictions as the sentence below having the same meaning as (56) is perfectly grammatical.

(57)   *Zjedzenie   wielu   rodzynek   przez   Janka   mogło   mu   zaszkodzić.*
        Eating   a lot of raisins   by   John   might have he_{dat} harm.

        'Eating many raisins might have harmed John.'

Note that the implicit assumption in our (as well as that of Heinz and Matiasek (1994)) rendering of nominalization is that this process, realized as a lexical rule, does not change CASE values of SUBCAT elements. In other words, structural arguments of a verb stay stuctural as arguments of deverbal nouns. Examples like (57) argue against maintaining this assumption. Instead, we will assume that the nominalization lexical rule changes all structural CASE values of SUBCAT elements to *lgen*.

Such an analysis should not seem *ad hoc* as there are independent reasons for the nominalization lexical rule to make changes in SUBCAT. The most conspicuous such change concerns sentential subjects. As the examples below show, they can be realized either by NP[*gen*] (cf. (58)), or by PP[PFORM 'przez' + *acc*] (cf. (59)):

(58) a.   *Maria   czeka   na   Janka.*
           $Mary_{nom}$ waits   on $John_{acc}$.

           'Mary is waiting for John.'

     b.   *czekanie   Marii   na   Janka*
           waiting $Marii_{gen}$ on $John_{acc}$

           'Mary's waiting for John'

(59) a.   *Jan   je   rodzynki.*
           $John_{nom}$ eats $raisins_{acc}$.

           'John is eating raisins.'

     b.   *jedzenie   rodzynek   przez   Jana*
           eating $raisins_{gen}$ by $John_{acc}$

           'John's eating raisins'

Thus, in the process of nominalization the SUBCAT list changes considerably.

We will not attempt to formally state the nominalization lexical rule here, as its technical characterization could only distort the picture drawn above. Instead, we will give examples of operation of this rule:

(60)
$$\begin{bmatrix} \textit{word} \\ \text{PHON } \langle \textit{czekać} \rangle \\ \\ \text{SYNSEM|LOC|CAT} \begin{bmatrix} \textit{category} \\ \text{HEAD } \textit{verb} \\ \text{SUBCAT } \langle NP_{\boxed{1}}[\textit{str}], PP_{\boxed{2}}[\text{PFORM 'na' + } \textit{str}] \rangle \end{bmatrix} \\ \mapsto \end{bmatrix}$$

$$
(61) \quad
\begin{bmatrix}
word \\
\text{PHON } \langle czekanie \rangle \\
\text{SYNSEM|LOC|CAT } \begin{bmatrix}
category \\
\text{HEAD } noun \\
\text{SUBCAT } \langle (NP_{\boxed{1}}[lgen]),\ (PP_{\boxed{2}}[\text{PFORM } `na'\ +\ str]) \rangle
\end{bmatrix}
\end{bmatrix}
$$

$$
\begin{bmatrix}
word \\
\text{PHON } \langle jeść \rangle \\
\text{SYNSEM|LOC|CAT } \begin{bmatrix}
category \\
\text{HEAD } verb \\
\text{SUBCAT } \langle NP_{\boxed{1}}[str],\ NP_{\boxed{2}}[str] \rangle
\end{bmatrix}
\end{bmatrix}
$$

$\mapsto$

$$
\begin{bmatrix}
word \\
\text{PHON } \langle jedzenie \rangle \\
\text{SYNSEM|LOC|CAT } \begin{bmatrix}
category \\
\text{HEAD } noun \\
\text{SUBCAT } \langle (NP_{\boxed{2}}[lgen]),\ (PP_{\boxed{1}}[\text{PFORM } `przez'\ +\ str]) \rangle
\end{bmatrix}
\end{bmatrix}
$$

$$
(62) \quad
\begin{bmatrix}
word \\
\text{PHON } \langle pomagać \rangle \\
\text{SYNSEM|LOC|CAT } \begin{bmatrix}
category \\
\text{HEAD } verb \\
\text{SUBCAT } \langle NP_{\boxed{1}}[str],\ NP_{\boxed{2}}[ldat] \rangle
\end{bmatrix}
\end{bmatrix}
$$

$\mapsto$

$$
\begin{bmatrix}
word \\
\text{PHON } \langle pomaganie \rangle \\
\text{SYNSEM|LOC|CAT } \begin{bmatrix}
category \\
\text{HEAD } noun \\
\text{SUBCAT } \langle (NP_{\boxed{1}}[lgen]),\ (NP_{\boxed{2}}[ldat]) \rangle
\end{bmatrix}
\end{bmatrix}
$$

The first two examples ((60) and (61)) correspond to the nominalization examples (58) and (59). In these examples all structural nominal phrases become lexical genitive, all the arguments become optional, and the nominative subject is changed to a prepositional phrase (example (61)). The last example shows that lexical complements (in this case *ldat*) do not change their case in the process of nominalization.

By positing such a lexical rule we have transferred part of the scope of Case Principle to the lexicon. The revised Case Principle will be rid of the noun clause:

Case Principle (Last Version)
In a *head-complement-structure* of category
- **verb:** the structural subject has a CASE value of *snom* if −NUMERAL
  or *sacc* if +NUMERAL,
- **verb[−neg]:** the structural object has a CASE value of *sacc*,
- **verb[+neg]:** the structural object has a CASE value of *sgen*,
- **preposition:** the structural object has a CASE value of *sacc*.

These are the only saturated or almost saturated *head-complement-structures* with structural arguments.

The reader familiar with Chomsky's GB will note that now the Case Principle is compatible with the independently motivated Case Assignment Principle of GB which states that "an NP receives Case at S-structure if it is governed by and adjacent to [−N]. [−N] elements are INFL[+tense], V and P" (cf. (Cowper, 1992, p. 102)).[41]

5   Passive

In this — very short — section we will show that (unlike in German, cf. Heinz and Matiasek (1994) and Pollard (1994)) passivization in Polish does not seem amenable to an analysis in terms of structural vs. lexical case dichotomy.

First of all, note that there are verbs requiring lexical objects which can be nevertheless passivized.

(63)   a.   *Jan   kieruje   fabryką.*
                 John$_{nom}$ manages factory$_{ins}$.

                 'John manages a factory.'

       b.   *Fabryka   jest kierowana   przez Jana.*
                 Factory$_{nom}$ is   managed   by   John$_{acc}$.

                 'A factory is managed by John.'

In this example it is the (lexical) instrumental object that gets passivized. According to the case lattice for Polish (cf. (4) on page 205) instrumental cannot be an instance of structural case. This observation is confirmed by the inability of the object in (63a) to change its case (to genitive) under nominalization or negation (i.e., by its failure to pass the two tests of structural environment):

(64)   a.   *kierowanie fabryką/*fabryki*
                 managing   factory$_{ins/gen}$

                 'managing a factory'

       b.   *Jan   nie kieruje   fabryką/*fabryki.*
                 John$_{nom}$ not manages factory$_{ins/gen}$.

                 'John does not manage a factory.'

Moreover, only some verbs subcategorizing for instrumental complements can be passivized:[42]

---

[41] See also Chomsky (1986a) p. 36, Franks (1990), Franks (1994) and Netter (1994).

[42] In Polish, unlike in German, the passivized object always receives the nominative case. Thus the sentence:

(i)   * *Chorągiewką jest machana   przez Jana.*
              Banner$_{ins}$ is   waved   by   John$_{acc}$

is clearly ungrammatical.

(65) a.   *Jan   macha chorągiewką.*
               John$_{nom}$ waves banner$_{ins}$.
               'John waves a banner.'

     b.   * *Chorągiewka jest machana przez Jana.*
               Banner$_{nom}$ is   waved   by   John$_{acc}$
               'A banner is being waved by John.'

In the example above, *macha* ('waves') seems to have the same syntactic subcategorization requirements as *kieruje*, but it cannot passivize.

Contrasts such as (63) vs. (65) suggest that passivization in Polish is independent of the syntactic characterization of the SUBCAT arguments. This conlusion is further supported by the observation that, contrary to the generalization often made, not all verbs which are transitive (in the sense that their SUBCAT value is ⟨NP[str], NP[str]⟩) can be passivized. Some exceptions are given below:

(66) a.   *Brzuch   boli   Jana.*
               Stomach$_{nom}$ aches John$_{acc}$.
               'John has a stomach ache.'

     b.   * *Jan   jest bolony przez brzuch.*
               John$_{nom}$ is   ached   by   stomach$_{acc}$.
               'John has a stomach ache.'

(67) a.   *Noga   swędzi Jana.*
               Leg$_{nom}$ itches John$_{acc}$.
               'John has an itchy leg.'

     b.   * *Jan   jest swędzony przez nogę.*
               John$_{nom}$ is   itched   by   leg$_{acc}$.
               'John has an itchy leg.'

Again, this contrasts with the usual behaviour of Polish transitive verbs:

(68) a.   *Jan   lubi Marię.*
               John$_{nom}$ likes Mary$_{acc}$.
               'John likes Mary.'

     b.   *Maria   jest lubiona przez Jana.*
               Mary$_{nom}$ is   liked   by   John$_{acc}$.
               'Mary is liked by John.'

Note that this contrast does not seem to be justified by any difference in case markings of the arguments of *boleć* and *swędzić* on the one hand, and *lubić* on the other.[43]

---

[43] Actually, verbs like *boleć* or *swędzić* are interesting in one more respect: they cannot be nominalized. This may be caused by the fact that the first argument of these verbs is not an agent. Thus, we could add the condition of agentivity to the prerequisites of nominalization lexical rule and, perhaps, passivization lexical rule. Such an amendment, however, would not explain the passivization behaviour of instrumental objects described above (cf. examples (63)–(65)).

The foregoing observations lead us to the conclusion that in Polish the phenomena of passivization is (to a large extent) independent of the syntactic case values of verb's arguments, and — as such — outwith the scope of this paper.[44]

6   Conclusion

The main thesis of this paper is this: the stuctural vs. lexical case dichotomy known in GB and transferred to HPSG by Heinz and Matiasek (1994) is confirmed by many phenomena in Polish. Of these phenomena, the behaviour of numerals and indefinite numerals provides the most striking such confirmation. We claim that our analysis constitutes an elegant and empirically adequate account of Polish numerals, the class of lexemes infamous for their quirky behaviour.

However, we leave many interesting questions concerning both case assignment and numerals unanswered. For example, we have had nothing to say here about the origin of case in circumstantials or about the syntax of names of numbers.[45] We have also ignored the problem of so-called *distributivus* (the case after distributive preposition *po*, cf. e.g. Gruszczyński (1989)). These phenomena are, as far as we know, still an uncharted region of formal linguistics.

Acknowledgments

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[44]The reader interested in semantic account of passivization in Polish is referred to Holvoet (1991).

[45]Pullum and Gazdar (1982) suggest that "knowledge of how to construct such names... is knowledge of mathematics rather than of language" (fn. 18).

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A Perspective on PPs

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Abstract

This paper investigates the treatment of the semantic contribution of prepositional phrases in HPSG, with particular reference to dative prepositional phrases (PPs). Using standard syntactic and semantic tests for argument structure, it is shown that certain *for-* and *to-*dative PPs must be construed as entities at a level between pure complements and pure adjuncts. A proposal is made for the semantic integration of PPs in an HPSG framework, based on work by Kasper (1993) and van Noord and Bouma (1994). The proposed approach accommodates various syntactic and semantic properties of adjuncts and provides a way of handling dative PPs which captures generalisations about their semantic contribution across verbal heads.

1   Introduction

This paper investigates the treatment of the semantic contribution of prepositional phrases in HPSG, with particular reference to dative prepositional phrases (PPs). It begins with an investigation of the status of *for-* and *to-*dative PPs in Section 2 – does the syntactic behaviour of these PPs as verbal complements warrant a treatment of their semantic contribution which ignores the consistency of this contribution across uses? It will be shown that certain of these PPs must be construed as entities at a level between pure complements and pure adjuncts. These *pseudo-complements*, as they will be called, have the syntactic properties of complements and the semantic properties of adjuncts. The integration of their semantics with the semantics of the modified entities can be treated in a manner analogous to the treatment for pure adjuncts. However, in Section 3 the pseudo-complements will be shown to have a semantic behaviour differing from the semantic behaviour of pure adjuncts, and this difference will be explicitly accommodated in the framework controlling the semantic integration.

Section 4 will discuss issues related to the treatment of prepositional phrases in HPSG, including general properties of adjuncts which must be accommodated and the existing HPSG treatments of adjuncts. The existing approaches will be shown to fail in adequately handling certain syntactic and semantic properties of adjuncts. In particular, interactions between surface order and semantic precedence are stumbling blocks for those approaches.

Section 5 will propose a framework based on work by Kasper (1994) and van Noord and Bouma (1994) which supports integration of the semantic contribution of all PP types. A semantic representation will be introduced which captures critical properties of verbal semantics and provides the foundation for the treatment of both pseudo-complements and adjuncts within the same system. The treatment of the semantic integration is handled via rules which will be explicitly stated and shown to provide a more satisfactory handling of surface order/semantic precedence interactions as well as other adjunct properties. The framework will also be shown to accommodate a treatment of the phenomenon of the dative alternation.

2   Adjuncts or Complements?

The model of the dative alternation as presented in Verspoor (1994) depends on an analysis of dative PPs[1] as subcategorized-for complements of the relevant verbs. It is not entirely obvious, however, that this is a semantically acceptable analysis.

The approach in Verspoor (1994) forces the semantic contribution of these PPs to be specified explicitly in the lexical entry for each verb which can appear with a dative PP. This ignores generalisations over the contribution of the PPs, in that the PPs seem to add similar information regardless of which specific verb they appear with. Thus in each of (1) and (2), the PP *for Mary* specifies who benefits[2] from the event described in the remainder of the sentence.

(1)   John baked a cake for Mary.

(2)   John made a drawing for Mary.

Likewise, the contribution of the inner NP in the alternate in (3) of (1) and the alternate in (4) of (2) can be identified as specifying who receives benefit from the outer NP.

(3)   John baked Mary a cake.

(4)   John made Mary a drawing.

A more general question arises from the observation of such generalisations – what is the status of these elements? Should they be treated as subcategorized-for complements or as adjuncts which make an independent, identifiable, semantic contribution across verbal heads? This will be investigated below through a series of standard syntactic and semantic tests for argument structure. The two types of dative PPs, *to*-PPs and *for*-PPs, will be contrasted in this investigation. The analysis will show that *for*-dative PPs and certain *to*-dative PPs behave as complements syntactically while behaving as adjuncts semantically. The remaining *to*-dative PPs behave as complements both syntactically and semantically.

2.1   Syntactic Tests for Argument Structure

2.1.1   The "do so" Test

The standard syntactic (structural) test for argument structure might be called the "do so" test. In X-bar theory terms, a complement is seen as combining with a lexical category to form an intermediate phrasal category while adjuncts combine with an intermediate phrasal category to produce the same category. The claim is that a full V-bar level constituent can be replaced by "do so". In the case of dative sentences, if the constituent {verb NP} in isolation (i.e. without the PP element) can be replaced by "do so", this indicates that the prepositional phrase is acting as a V-bar adjunct, because {verb NP} is construed as a V-bar constituent in isolation. If only the full constituent {verb NP PP} can be replaced by "do so", the PP must be construed as a complement.

---

[1] PPs which participate in the dative alternation, i.e. *to*-datives, as in sentences of the form *John gave a book to Mary* which alternate with those of the form *John gave Mary a book*, and *for*-datives, as shown in (1) and (3).

[2] in some way – how precisely will be discussed in Section 3.2.1.

to-datives

As noted in Jackendoff (1990), there seem to be two types of verb classes which can appear with *to*-datives. The first type are verbs for which the PP is a complement, while the PP is an adjunct for verbs of the second type. The data in (5)-(12) suggest that *give* and *tell* belong to the first subclass (despite the optionality of the *to*-PP with *tell*), while *send* and *kick* belong to the second.

(5) a.   Adam gave a book to Debbie and Brian also did so.

     b.   *Adam gave a book to Debbie and Brian did so to Susan.

(6) a.   Adam told a story to Debbie and Brian also did so.

     b.   *Adam told a story to Debbie and Brian did so to Susan.

(7) a.   Adam gave a book to Debbie in the library.

     b.   *Adam gave a book in the library.

(8) a.   Adam told a story to the children in the bedroom.

     b.   Adam told a story in the bedroom.

(9) a.   Sam sent a letter to Bill and Mark also did so.

     b.   Sam sent a letter to Bill and Mark did (so) to Susan.

(10) a.   Sam kicked a ball to Bill and Mark also did so.

     b.   Sam kicked a ball to Bill and Mark did (so) to Susan.

(11) a.   Sam sent a letter from the post office.

     b.   Sam sent a letter to Bill from the post office.

(12) a.   Sam kicked a ball in the park.

     b.   Sam kicked a ball to Bill in the park.

for-datives

The application of this test to *for*-datives, as shown in (13)-(14), provides evidence that these prepositional phrases should be treated as adjuncts.

(13) a.   Adam baked a cake for Debbie and Brian also did so.

     b.   Adam baked a cake for Debbie and Brian did so for Susan.

(14) a.   Adam sang a song for Debbie and Brian also did so.

     b.   Adam sang a song for Debbie and Brian did so for Susan.

2.1.2 Iterability test

Pollard and Sag (1987) (P&S 1987) discuss the complement vs. adjunct distinction, reviewing several syntactic and semantic tests which generally capture usage distinctions between the two types of constituents.

One of the syntactic tests is the iterability test. In general, several instances of the same adjunct type can combine with the same head, as shown in (15).

(15)   Kim and Sandy met in Baltimore in the Hyatt hotel in the lobby.
         [P&S 1987, (257a)]

Complements, on the other hand, cannot be iterated. Thus in (16)-(18) the prepositional phrases seem to be complements rather than adjuncts.

(16)   *Adam gave a book to Debbie to Frank.

(17)   *Adam told a story to the kids to the adults.

(18)   *Adam sent a letter to Mary to Diane.

By the same logic, however, it would appear that the prepositional phrases in (19)-(21) are complements as well.

(19)   *Sam kicked a ball to Bill to Frank.

(20)   *Sam sent a letter to Bill to Frank.

(21)   *Adam baked a cake for Debbie for Susan.[3]

The problem here is that adjuncts can really only be iterated if the semantic (meaning) contribution each makes is in a relation of containment to the previous adjuncts. Thus in (15), the adjuncts can be iterated because each one can be interpreted as being contained within the location specified by the previous adjunct, making more precise the locative information, rather than providing an overriding semantic contribution. In (16)-(21), the prepositional phrase specifies the (intended) recipient of some object. The containment relation does not apply to distinct recipients and therefore these adjuncts are incompatible with iteration. This analysis is confirmed by the data in (22) and (23), which contrast with (15) and (20) respectively. Sentence (22) is ungrammatical because Chicago cannot be contained within Baltimore, while (23) is grammatical because the head office of the Times is contained within New York.[4]

(22)   *Kim and Sandy met in Baltimore in Chicago.

(23)   Adam sent a letter to New York to the head office of the Times.

---

[3] This sentence is okay, however, on an interpretation in which the entire action of *Adam baking a cake for Debbie* has been performed for Susan's benefit. See Section 3.

[4] Thanks to Janet Hitzeman for the suggestion of this data.

Similarly, temporal adjuncts which are very similar in content and type to locative adjuncts can only be iterated if the information conveyed by a given adjunct is contained in the information conveyed by previous adjuncts. One point in time does not contain another, but a point of time is contained in a span of time. Thus (24a) is ungrammatical, while (24b) is not. The difference here has nothing to do with a difference in status between the PPs, but rather the fact that certain semantic roles can be multiply specified via the containment relation while for other roles this relation does not apply.

(24) a.   *Sam kicked a ball at 10 o'clock at 8 o'clock.

     b.   Sam kicked a ball in the morning at 10 o'clock.

Furthermore, some of the examples Pollard and Sag provide of adjunct iteration rely on pragmatic factors and do not seem to be wholly grammatical. For example, (25) can seemingly only be interpreted with the two prepositional phrases as adjuncts if the comma indicates a conjunction such as "and".

(25)   Heather opened the rusty lock with a key, with a pair of pliers. [P&S 1987, (257e)]

Applying this interpretation requirement to the ungrammatical sentences above improves their acceptability, as shown in (26)-(29). These sentences seem to display ellipsis, rather than providing a sense of the underlying argument structure.

(26)   Adam gave a book to Debbie and to Frank.

(27)   Sam kicked a ball to Bill and to Frank.

(28)   Sam sent a letter to Bill and to Frank.

(29)   Adam baked a cake for Debbie and for Susan.

This test is therefore not a reliable indicator of argument structure, and in fact cannot be viewed as purely syntactic since the phenomenon of iterability seems to interact with semantic factors. The evidence it provides for treating the dative prepositional phrases as complements rather than adjuncts will not be taken as definitive.

2.1.3   Relative Order

Pollard and Sag (1987) point out that in English adjuncts tend to be ordered after complements, suggesting that prepositional phrases which are required to precede other kinds of adjuncts are actually complements.

The data in (30)-(35) suggest that the dative prepositional phrases should be treated as complements according to the relative order diagnostic. These PPs must appear before any other adjunctive phrases.

(30) a.   Adam gave a book to Debbie in the library.

b.　　　*Adam gave a book in the library to Debbie.

(31)　a.　　　Adam told a story to the children in the bedroom.

b.　　　*Adam told a story in the bedroom to the children.

(32)　a.　　　Adam sent a letter to Mary from the post office.

b.　　　*Adam sent a letter from the post office to Mary.

(33)　a.　　　Adam kicked a ball to Mary in the park.

b.　　　*Adam kicked a ball in the park to Mary.

(34)　a.　　　Adam baked a cake for Mary in the kitchen.

b.　　　?Adam baked a cake in the kitchen for Mary.

(35)　a.　　　Adam sang a song for Mary in the pub.

b.　　　?Adam sang a song in the pub for Mary.

2.1.4　Complement-Internal Gaps

Some adjuncts appear to be extraction islands, as shown in (36), while unbounded dependencies into complements are generally possible, as shown in (37). The data in (38)-(40) therefore suggest that the dative prepositional phrases are complements rather than adjuncts.

(36)　　*Which endangered species did Sandy meet someone fond of _? [P&S 1987, (260c)]

(37)　　Which endangered species did Kim impress you as being most fond of _?
[P&S 1987, (261c)]

(38)　　Whom did Adam give a book to _?

(39)　　Whom did Adam kick a ball to _?

(40)　　Whom did Adam bake the cake for _?

Pollard and Sag acknowledge, however, that certain adjunct types do appear to sanction internal gaps, as shown in (41)-(42).

(41)　　This is the blanket that Rebecca refuses to sleep without _.　　[P&S 1987, (264a)]

(42)　　Which symphony did Schubert die without finishing _?　　　[P&S 1987, (264c)]

Furthermore, one of the examples they give of an ungrammatical sentence with an adjunct-internal gap, shown in (43a), seems to become more acceptable with a different adjunct, as in (43b). The change involves replacing the "motivational" adjunct with a *for*-PP, suggesting that this type of adjunct allows internal gaps. It therefore may be incorrect to assume that the data in (38)-(40) necessarily indicate that the dative PPs should be treated as complements.

(43) a.   * Which famous professor did Kim climb K-2 without oxygen in order to impress
              _?   [P&S 1987, (260b)]

      b.   Which famous professor did Kim climb K-2 without oxygen for _?

2.2   Semantic Tests for Argument Structure

2.2.1   Constancy of Semantic Contribution

Pollard and Sag (1987) discuss the semantic basis for the distinction between arguments and
adjuncts as follows:

> In general, a given adjunct can co-occur with a relatively broad range of heads
> while seeming to make a more-or-less uniform contribution to semantic content
> across that range. A given optional complement, by contrast, is typically limited
> in its distribution to co-occurrence with a small (and often semantically restricted)
> class of heads (possibly even a single item); in addition, the semantic contribution
> of the complement is idiosyncratically dependent on the head. (p. 136)

In addition, the contribution of the adjunct to the semantic content of a phrase is not simply
the filling of some role in the head's relation. It is this observation which seems to distinguish
the two types of *to*-datives. For the "true" *to*-datives, such as *give* and *tell*, the semantic
information contributed by the dative PP is directly relevant to the meaning of the verb, fills
a particular role (such as that of RECIPIENT in the *give* relation) and is therefore a "true"
argument of the verb. For the "adjunct" *to*-datives, the semantics of the dative PP provides
additional information about the situation being described by the sentence, but does not fill
a particular role in the verb's relation.

Both *to*- and *for*-datives appear with a wide range of heads. More importantly, they seem to
have a constant semantic contribution across each use. In general terms, the *to*-datives seem
to indicate the intended recipient of some object, and the *for*-datives seem to indicate the
intended beneficiary of something.[5]

2.2.2   Functor vs. Argument

Pollard and Sag (1987) remind us that much work suggests that the adjunct/complement dis-
tinction reduces to whether the element in question is semantically a functor or an argument.
This seems to hinge on the type of semantic contribution the element makes to the sentence
in which it appears. The discussion of this with respect to dative PPs is found in the previous
section and will not be repeated here. The conclusion is simply that in most contexts dat-
ive PPs seem to make a consistent semantic contribution augmenting the semantic relation

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[5]Since the semantics of these elements seems to be uniform across heads, there is semantic evidence in
support of their treatment as adjuncts. This consistent contribution was observed by Jackendoff (1990) and
formalized in terms of "adjunct rules" which identify the semantic contribution of particular elements in certain
syntactic constructions and indicate how this contribution is to be integrated into the semantic representation
for the overall construction. The contribution can also be observed in the core structures of dative verbs, as
presented in Verspoor (1994).

expressed by the verb rather than a contribution specifically dictated by the verb, and that they therefore should be treated as functors which select their verbal heads.

2.2.3   Entailment Tests

A good indicator of a verb's argument structure is the entailments of sentences containing the verb. For example, the optional prepositional phrases in (44a) seem to be optional complements of the verb *complain* rather than adjuncts due to the entailments displayed in (44b). (Examples from Wechsler 1994.)

(44) a. John complained (to Mary) (about the heat).

     b. John complained.
        $\models \exists x, y \mid$ John complained to x about y.

In contrast, adjunctive prepositional phrases do not result in such entailment patterns, as shown in (45). These entailment patterns indicate whether or not particular semantic information is directly relevant to the meaning of the verb. Information which is not directly relevant should be treated as an adjunct rather than an argument.

(45) a. John sang (to Mary) (about his homeland).

     b. John sang.
        $\not\models \exists x \mid$ John sang to x.
        $\not\models \exists y \mid$ John sang about y.

Considering the application of this test to *to*-datives, we find the entailment patterns in (46). The data supports Jackendoff's assertion that some *to*-datives require the PP as an argument, while for others it is an adjunct. What is interesting, however, is the contrast between (46b) and (46c). The notion of a recipient is more central to the notion of *sending* than to *kicking*, since *send* necessarily involves an (intended) transfer, while *kick* does not. Thus there are semantic differences in the relationship these verbs have to the *to*-PP which are not reflected in the syntactic tests for argument structure.

(46) a. Adam told a story.
        $\models \exists x \mid$ Adam told a story to x.

     b. Sam sent a letter.
        $\models \exists x \mid$ Sam sent a letter to x.

     c. Sam kicked a ball.
        $\not\models \exists x \mid$ Sam kicked a ball to x.

Applying the test to *for*-datives, we have the entailment patterns in (47). The information added by the PPs thus seems to be adjunctive.

(47) a. Adam baked a cake.
        $\not\models \exists x \mid$ Adam baked a cake for x.

   b.   Adam sang a song.
            $\not\models \exists x \mid$ Adam sang a song for x.

However, the semantic intuitions about the adjunctive nature of *for*-datives become a bit confused when we consider the data in (48) (Haegeman 1991).

(48) a.   Hercule bought a detective story for Jane.

     b.   Hercule bought Jane a detective story.

     c.   Hercule bought a detective story.

In an unmarked context, (48c) is taken to mean that Hercule bought the story for himself. This suggests that the semantic relation of *buying* includes the person for whom the bought object is intended. Thus, (48c) $\models \exists x \mid$ Hercule bought a detective story for x. This would seem to argue against the treatment of the *for*-PP as an adjunct for the verb *buy*, but the semantic intuitions about *for*-datives remain valid in the general case.

2.3   Conclusions

The most influential argument for the treatment of certain dative PPs as adjuncts rather than complements is that they seem to have a constant semantic contribution across all applications. The fact that these PPs often appear to behave as complements syntactically is overshadowed by the semantic generalisations which can be made by treating them as adjuncts. It does not seem to make sense to treat these PPs as idiosyncratically contributing semantic information to the heads they modify when this semantic contribution is so consistent. This consistency, however, does not seem to hold as strongly for *to*-dative PPs as for *for*-dative PPs. The syntactic and semantic tests raise much contradictory evidence for the argument status of the *to*-dative PPs.

The *send* and *kick* type *to*-datives and the *for*-dative PPs seem to be instances of something which I will call a *pseudo-complement*. This is an element which often behaves syntactically as a complement but which behaves semantically as an adjunct. The information expressed by the pseudo-complement cannot be logically inferred from the use of the verb, but is somehow "closer" to the meaning expressed by the verb than true adjuncts. This idea will be developed further in the section which follows.

3   Pseudo-Complements

3.1   Definition and Relation to adjuncts

It is possible to define a pseudo-complement precisely in terms of its relationship to the semantics of the verbs it modifies. Specifically, a pseudo-complement is an element with an independent semantic contribution involving a semantic argument of the verb. In contrast, adjuncts are elements with an independent semantic contribution involving the full event described by the verb and its semantic arguments. Thus the semantics of a pseudo-complement

preposition specifies a relation between an element *within* the semantics of the verb it modifies and the object of the preposition, while the semantics of an adjunct specifies some operation on the full event conveyed by the sentence (minus the adjunct).

Consider the sentences in (49)-(51).

(49) a.   John sang a song about his homeland.

b.   John sang a song for Mary.

c.   John sang a song in the park.

d.   John sang a song at noon.

e.   John sang a song $\left\{ \begin{array}{l} \text{about his homeland} \\ \text{for Mary} \end{array} \right\} \left\{ \begin{array}{l} \text{in the park.} \\ \text{at noon.} \end{array} \right\}$

f.   John sang a song $\left\{ \begin{array}{l} \text{in the park} \\ \text{at noon} \end{array} \right\} \left\{ \begin{array}{l} \text{*about his homeland.} \\ \text{?for Mary.} \end{array} \right\}$

(50) a.   Sam sent a letter to Bill.

b.   Sam kicked a ball to Bill.

c.   Sam sent a letter to Bill from the post office.

d.   Sam kicked a ball to Bill in the park.

e.   *Sam sent a letter from the post office to Bill.

f.   *Sam kicked a ball in the park to Bill.

(51) a.   *John ran a marathon about his homeland.

b.   John ran a marathon for Mary.

c.   John ran a marathon in the park.

d.   John ran a marathon at noon.

e.   John ran a marathon for Mary $\left\{ \begin{array}{l} \text{in the park.} \\ \text{at noon.} \end{array} \right\}$

f.   John ran a marathon $\left\{ \begin{array}{l} \text{in the park} \\ \text{at noon} \end{array} \right\}$ for Mary.

None of the PPs in the above sentences contains information which is entailed by the verb's semantics. However, in (49) and (51) there is a clear difference between the PPs in the (a,b) sentences and the (c,d) sentences. The PP in (49a) expresses a property of the *song* which is sung by John, while the PPs in the (c,d) sentences provide information about the situation described by the sentence (minus the PP). Likewise, in (50) the PP *to Bill* specifies

a particular goal relation between *Bill* and *the ball/the letter*,[6] rather than a relation between *Bill* and the full situation expressed by the sentence (minus the PP).

It could be argued that the PP in (49a) is a structural modifier of the NP rather than the VP, such that *a song about his homeland* forms a single constituent. This would explain the grammaticality of (52). It seems, however, that the analysis in which the PP modifies the VP constituent must also be available, as shown by the grammaticality of the sentences in (53)-(54). These sentences appear to be licensed semantically – there is an argument of *sing* which is embedded into the semantics of the verb (singing entails singing *something*, even if that something is an unnamed tune; that is, it involves producing sound which is normally called a song) and this argument is available as the element within the verbal semantic representation which can be picked out for the relation contributed by a pseudo-complement. Furthermore, the existence of sentences such as (55), in which there is no explicit NP to which the PP could be attached, provides evidence that the PP can be viewed as specifying a relation involving an argument internal to the verb – an argument which is unexpressed in this case but still entailed by the verb and therefore a part of the verbal semantic argument structure.[7] It is not the event of *singing* which is *about John's homeland*, but rather *what* John was singing.

(52)   A song about his homeland was sung by John.

(53)   A song was sung by John about his homeland.

(54)   A song was sung by the choir about freedom.

(55)   John sang about his homeland.

Sentence (49b) is ambiguous between two interpretations – one in which the PP behaves as a pseudo-complement and a second in which it behaves as a true adjunct. On the pseudo-complement interpretation, the PP expresses that the song itself is for Mary's benefit, while on the adjunct interpretation it expresses that the entire activity of singing is for Mary's benefit.

The availability of both of these interpretations implies that both a pseudo-complement and an adjunct can appear in the same sentence. Not only is this evidenced by (49e), but more interestingly by (56), which can only be interpreted as indicating that the song was for Mary's benefit and that the entire activity was done for Bill's benefit.[8]

(56)   John sang a song for Mary for Bill.

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[6] In terms of the representation of Verspoor (1994), this relation is namely: $\text{GO}\left(\left\{\begin{array}{c}\text{ball}\\\text{letter}\end{array}\right\}, \text{to (Bill)}\right)$

[7] Note that this sentence differs from sentences which superficially resemble it, e.g. *John worried about his homeland*, in which no verb-internal argument to be modified by a pseudo-complement clearly exists. The difference is that an act of worrying entails a topic about which one worries, while an act of singing does not entail a song topic. That is, *John worried* $\models \exists x | John\ worried\ about\ x$, while *John sang* $\not\models \exists x | John\ sang\ about\ x$. Thus the fact that the object of the event in the *worry* sentence is not clear does not discredit a pseudo-complement analysis of verbs like *sing* which do have a semantically entailed product.

[8] If this sentence is difficult to interpret, imagine a context, for example, in which Bill and Mary are unable to celebrate their anniversary together because they are living in different places, so Bill asks John to go to where Mary is and sing.

There is a syntactic ordering preference for the pseudo-complement PPs to precede the adjunctive PPs, as shown by the contrast between (49e) and (49f), and between (50c,d) and (50e,f). The interpretation of the *for Mary* version of the sentences in (49f) is questionable – it is unclear whether the pseudo-complement interpretation of the PP is available when preceded by another adjunct. It could be postulated on the basis of the contrast in (49f) and the sentences in (50) that the pseudo-complement interpretation of a PP is only available in immediately post-verbal-complement position, and that therefore *for Mary* in (49f) must be interpreted as specifying a relation involving the entire event expressed by the verb. This constraint can be captured in terms of obliqueness – pseudo-complements are semantically less oblique than adjuncts and less oblique elements precede more oblique elements in English.

This analysis leads to an explanation for the ungrammaticality of (51a). The PP *about his homeland* can only behave as a pseudo-complement with respect to a verb phrase; it does not provide information which could apply to a full situation. Thus there are certain PPs which can only behave as pseudo-complements and other PPs which can only behave as adjuncts. Similarly, certain verbs are not 'open' to pseudo-complementation. Although the semantic basis for the 'openness' criteria will not be explored in this paper, one factor influencing a verb's ability to allow pseudo-complementation may be whether the activity expressed by the verb can be construed as "creating" its NP object in some sense.[9] *Run* therefore must be closed to pseudo-complementation in its transitive form.[10] This means that the PP in (51b) can only be interpreted as a true adjunct, that is that the whole activity of *John running a marathon* was done for Mary. The marathon itself cannot be interpreted as benefitting Mary. This also explains the contrast in acceptability between (49f) and (51f). There is an obliqueness difference between the PPs in the former on the pseudo-complement interpretation, which prevents the PPs from freely alternating in syntactic order. In contrast, there is no obliqueness difference between the adjuncts in the latter, enabling the PPs to appear in any order.

3.2 Pseudo-complement semantics

3.2.1 The *for*-dative pseudo-complement

In the analysis in Verspoor (1994), *for*-dative prepositional phrases are treated as arguments of the verbs with which they appear. Their semantic contribution is therefore directly integrated into the semantics of the verb at the lexical level. The semantic analysis is based on the discussion of Pinker (1989). The core semantic content of each of the *for*-dative verbs for sentences of the form NP_1 *gimbles* NP_2 *for* NP_3[11] can be paraphrased as, "NP_1 acts on NP_2 in order for NP_3 to have NP_2". The contribution of the *for*-PP can be identified as the "in order for NP_3 to have NP_2" portion of the paraphrase. In the notation of Verspoor (1994),

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[9] Thus "singing" involves the physical creation of a song, "baking" involves bringing into existence baked goods, etc. This constraint corresponds to the constraint suggested by Jackendoff (1990, p. 196) on the double object form of *for*-beneficiary sentences, but in this case applies to the available interpretations for the **dative** forms of different types of verbs.

[10] Intransitives are not open to pseudo-complementation, nor are ditransitives. In the former, no semantic argument within the verb semantics is available to be modified and in the latter the element being modified would be unclear. 'Openness' criteria may then also depend on the semantic "base" argument structure of the verb – that is, *run* may not be open to pseudo-complementation because its base form is intransitive.

[11] *Gimbles* is a marker for verbs which can appear in this construction.

this is represented as a HAVE event related by a *for_to* subordinating relation to the main event expressed by the semantics of *gimble*.

Jackendoff (1990) argues that this HAVE event doesn't properly capture the semantics contributed by the *for*-PP. He claims that the event is rather forced when applied to certain verbs. For example, when *John sings a song for Mary*, in what sense does Mary *have* the song? Jackendoff therefore suggests that the contribution of the *for*-PP is better described as indicating that the object of the preposition (NP_3) is intended to benefit from the action of the subject (NP_1). The event embedded by the *for_to* relation would more appropriately be as in (57b) rather than Pinker's proposal of (57a). This event represents "NP_1 affects NP_3 positively", or in other words, "NP_3 is intended to benefit from the actions of NP_1".

(57) a. $(\text{HAVE } (\text{THING}_3, \text{THING}_2))$ [Pinker's proposal]

      b. $(\text{AFF}^+ (\text{THING}_1, \text{THING}_3))$ [Jackendoff's proposal]

However, Jackendoff's proposal also does not seem to accurately capture the interpretation associated with the PP in this form. The benefit represented in his form is indirect − since NP_1 does not act upon NP_3 directly, what actually is intended to benefit NP_3 remains unclear. In fact, it seems that what is intended to benefit NP_3 directly is NP_2, the object upon which NP_1 acts in order to benefit NP_3. Thus it seems more accurate to represent the semantics of the *for*-dative as indicated in (58).

(58)   *for_to* $(\text{AFF}^+ (\text{THING}_2, \text{THING}_3))$

This will be the semantics associated with the *for*-dative preposition throughout the remainder of this paper. It is clear that this representation involves a pseudo-complement interpretation since one of the arguments of the AFF^+ predicate is a semantic argument of the verb. In addition, the treatment of the pseudo-complement modification will include tying the subordinated *for_to* relation directly to the semantics expressed by the verb rather than to the situation captured in the sentence.

In contrast, the *for*-adjunct preposition (as in *John ran a marathon for Mary*) adds the semantic content in (59) to the representation of the full situation. Its definition specifies that the AFFecting argument of the AFF^+ predicate corresponds to the entire event expressed in the sentence. The object of the preposition is therefore affected positively by the event, rather than by a particular semantic element within the event representation.

(59)   *for_to* $(\text{AFF}^+ (\text{EVENT}, \text{THING}_3))$

Note that although Jackendoff (1990, p.195) suggests that the *for*-PP can be given precisely such an event interpretation, he provides no formal mechanism for doing so, or for distinguishing between the two possible interpretations of the *for*-PP. In Jackendoff's approach, the two different readings of the *for*-dative form must fall out of a single representation (that in (57b)), which fails to adequately reflect either reading and does not account for the identity of the interpretation of the double object form with *one* of the dative form readings (that in (58)).

The distinction that pseudo-complements pick out a semantic argument from within the verb semantics while adjuncts incorporate the event expressed in the sentence as an argument in

the relation they express is thus formalized in the semantics of the two forms associated with *for*. The difference in where the semantic contribution is integrated with respect to the verb semantics – that pseudo-complements contribute to the semantics of the verb while adjuncts contribute to the full situation expressed by a sentence – will be discussed in more detail in Section 5 and handled by the lexical rules which will be introduced there.

3.2.2 The *to*-dative pseudo-complement

In Verspoor (1994), the *to*-dative prepositional phrase is also explicitly specified as an argument of each verb with which it appears. The core semantic content for each of the *to*-dative verbs for sentences of the form NP_1 *gimbles* NP_2 *to* NP_3 can be paraphrased as, "NP_1 acts on NP_2, causing NP_2 to go to NP_3". The contribution of the *to*-PP can thus be identified as the "causing NP_2 to go to NP_3" portion of the paraphrase. In the notation of Verspoor (1994), this is represented as a GO event related by an *effect* subordinating relation to the main event expressed by the semantics of *gimble*, as shown in (60). The meaning of this preposition is such that no adjunctive interpretation would make sense – it wouldn't make sense for an event to GO somewhere, and thus no adjunct interpretation exists for it.

(60)   *effect* (GO (THING$_2$, (to (at (THING$_3$)))))

3.3   Conclusions

Pseudo-complements are elements very close in nature to true verbal complements. They specify a particular relation between a semantic argument of the verb and the object of the preposition. Their semantics can, however, be treated by the same mechanisms as true adjuncts. Pseudo-complements and adjuncts share the property of specifying a consistent, contentful, and identifiable relation which can be applied across modified heads.

Specification of the type of modification which an individual PP may provide with respect to a head must occur lexically. Three types of PPs will be allowed for in the treatment of PPs to be introduced in Section 5 (in particular, in the sort hierarchy) – PPs which can only behave as pseudo-complements, PPs which can only behave as adjuncts, and PPs which are ambiguous between the two. The type of a particular use of a preposition must then be specified in the lexical entry of the preposition. This type will be used as a criteria for determining how semantic integration between the semantics of the PP containing the preposition and the semantics of the modified verb is to occur.[12]

4   Semantic integration of pseudo-complements/adjuncts

4.1   Characteristics of adjuncts to be accounted for

There are certain characteristics which pseudo-complements and adjuncts share which must be taken into consideration in any treatment of the semantic contribution of these elements.

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[12]i.e. which lexical rule will apply – see Section 5; 5.6 in particular.

4.1.1   Adjuncts have a consistent semantic contribution

As was discussed in Section 2.2.1, adjuncts have an identifiable, consistent semantic contribution across heads. The implication of this for any treatment of adjuncts is that there should be a single lexical entry which specifies the meaning of the adjunct with respect to a particular type of head. That is, the content of the adjunct combines in a certain general way with the content of the element it modifies (a verb or noun phrase, for example) and this must be specified only once. Since this combination does not change with every type of head, a single specification is much more efficient than incorporation into the lexical entry, into the subcat list, of each verbal head with which an adjunct can appear.

In particular, a single lexical entry can only be realized if adjuncts select the types of heads they modify. Were individual heads to idiosyncratically specify the adjuncts with which they can appear, the semantics of the adjunct could conceivably be incorporated with the content of the head in a different way for each head, and in effect the adjunct need not have any independent meaning. Furthermore, this approach requires that the set of adjuncts which could appear with a particular head be specified in advance, at the level of the lexicon, for every individual element in the lexicon which could potentially be modified by an adjunct. This is clearly not a desirable consequence.

An additional semantic argument for the selection of a head by an adjunct is observed by Kasper (1994): "The semantic contribution of a modifier generally must incorporate the semantic contribution of the element that it modifies, whereas the semantic content of the modified element (the syntactic head) does not depend crucially on any of its potential modifiers".

4.1.2   Restrictive, Operator, and Thematic adjuncts

Adjuncts have traditionally been analysed as being of one of two types:[13] *restrictive* adjuncts and *operator* adjuncts. Restrictive adjuncts are adjuncts which "restrict" the value of a particular index representing an object, event, or situation, such as the index for location or time of an event. These adjuncts specify properties to be associated with the indices. Operator adjuncts are adjuncts which take the content of what they modify as an argument in a semantic operation, predicating something of that content. Examples of this type of adjunct include negatives, frequentatives, and causatives.

The distinction between these adjunct types provides an explanation of the differences in the semantics of (61a) and (61b), containing operator adjuncts, as compared to the lack of semantic difference between (62a) and (62b), containing restrictive adjuncts. In (61a), the twenty minute duration is a property of the event whose frequency is described, while in (61b), the 'twice-dailiness' is a property of the event whose duration is described (Pollard and Sag 1987). In both (62a) and (62b), *in the park* specifies the location of the jogging, and *yesterday* specifies the time of the jogging, regardless of their surface order. They each specify (or *restrict*) properties of the main event described in the sentence, rather than predicating something of an event they receive as an argument, as in (61). (Sentences from P&S 1987, (252))

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[13] This discussion of adjunct types is mainly derived from the discussion in Kasper (1994).

(61) a.   John jogged for twenty minutes twice a day.

     b.   John jogged twice a day for twenty years.

(62) a.   John jogged in the park yesterday.

     b.   John jogged yesterday in the park.

In essence, restrictive adjuncts seem to add new information about an index for which the event was previously underspecified (e.g. location) while operator adjuncts take the event as an argument, thereby building up a more complexly structured semantic representation for the sentence.

There is a group of adjuncts which semantically do not clearly fit either of these two types. These adjuncts, like all other adjuncts, add information to the basic event expressed by the verb plus its semantic arguments. However, they do not simply restrict an index specifying something about the situation in which the event occurs or predicate something of that situation. The function they perform with respect to the basic event expressed by the verb is to relate information via one of a predetermined, limited, set of subordinating relations. They can be viewed as adding a theme to the verb semantics, and thus will be called *thematic* adjuncts. Examples of thematic adjuncts can be found in (63)-(65). In (63), the *because_ of*-PP adds information which explains the cause of the situation expressed in the remainder of the sentence. In (64), the *with*-PP expresses the means by which the situation expressed in the sentence minus the PP occurred. In (65), the *to*-PP expresses a motivation for the situation in the remainder of the sentence.

(63)   Peter reads well because of the tutoring.   [Kasper 1994, (10a)]

(64)   Peter opened the door with the key.

(65)   Peter read the book to learn about World War II.

4.1.3   Surface order vs. Semantic precedence

The relative surface order of multiple restrictive adjuncts generally has no effect on their interpretation. The relative semantic scope of multiple operator adjuncts, on the other hand, sometimes does and sometimes does not depend on their relative surface order.[14] Since the order of interpretation of operator adjuncts can affect the overall interpretation of a sentence, it is important to account for interpretation orders which vary from straight surface order, in addition to accounting for interpretation orders which are dependent on surface order.

An example of the inconsequence of surface order for restrictive adjuncts was shown in (62) above. The sentences in (61) showed that relative surface order can influence the interpretation of the sentence. Contrasting (61) with (66) indicates that the content of the multiple adverbials can also influence their relative interpretation. Sentences (61a) and (66a) have the same semantics despite their differences in surface order. Sentence (66b) is ungrammatical because the combination dictated by the surface order is temporally impossible − it is not possible to repeat an event which itself lasts twenty years twice within one day.

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[14]See Kasper (1994) for a good overview of the cases of interaction among multiple adjuncts.

(66) a.　　　　John jogged twice a day for twenty minutes.

　　b.　　　　*John jogged for twenty years twice a day.

Clearly there are very complex constraints governing both the semantic composition and the relative surface order of multiple adverbials. A treatment of adjuncts must therefore provide a mechanism for the application of these constraints.

4.1.4　Redundancy constraints

It is important in any treatment of adjuncts to prevent multiple adjuncts from providing information which fills the same role. Sentences such as those presented in (67)-(69) must be prohibited. For thematic adjuncts, the constraint seems to be that only one thematic adjunct corresponding to a particular subordinating relation is allowed, while for restrictive adjuncts the constraint is that multiple restrictive adjuncts relating to the same index must have values which are related via containment (as discussed in Section 2.1.2).

(67) a.　　　　Peter reads well because of the tutorials and because of the homework exercises.

　　b.　　　　*Peter reads well because of the tutorials because of the homework exercises.

(68) a.　　　　Heather opened the rusty lock by oiling it and by applying force.　　[cf. (25)]

　　b.　　　　*Heather opened the rusty lock by oiling it by applying force.

(69) a.　　　　Sam kicked a ball at 10 o'clock and at 8 o'clock.　　　　　　　[cf. (24)]

　　b.　　　　*Sam kicked a ball at 10 o'clock at 8 o'clock.

If information is explicitly coordinated through a conjunction or disjunction, it is possible for multiple PPs of the same type to appear in a sentence. Since coordination in effect builds a complex element of the same category as its components, this data can be interpreted as evidence that exactly one PP making a particular type of semantic contribution can appear in a sentence. Although this does not hold for PPs which supply information related by containment, it does hold for most PP types.

4.1.5　Interspersal of adjuncts with complements

Kasper (1994) presents a detailed analysis of word-order phenomena in the German Mittelfeld: "the part of the German clause between the finite verb (or the beginning of verb final clauses) and the clause final verb or verb cluster, if any." In particular, he observes that the linear order of verb complements and adjuncts within the Mittelfeld is relatively free. Any treatment of adjuncts must therefore be able to account for this interspersal.

4.2   The standard HPSG approach

The treatment of adjuncts in Pollard and Sag (1994) centres on the selection of a head by an adjunct. The adjunct specifies the type of head which it modifies via the MOD feature of its SYNSEM:LOC:CATEGORY:HEAD field. Semantic integration is specified in the lexical entry of the adjunct, via structure sharing between a substructure of the head's content and the content of the adjunct. Adjuncts differ from complements in that they have a non-null MOD value, that they are not subcategorized-for by the element with which they combine, and that they are joined with that element via a different mechanism.

Immediate dominance (ID) schemata govern the permissible configurations of immediate consituency (akin to phrase-structure trees) in HPSG. One such schema creates a *head-adjunct-structure*, combining a head and an adjunct into one structure, and ensuring that the head of the constituent is an element allowed by the MOD feature of the adjunct. The content of the mother in a head-adjunct-structure is required to be token-identical with the content of the adjunct via the Semantics Principle. This guarantees that the appropriately integrated semantics is associated with the phrase as a whole.

The specification of the ID schemata in standard HPSG does not allow for Mittelfeld phenomena. The schemata handling complements require that all complements other than the subject must be combined at once into a phrase. The adjunct attachment schema allows the adjunct to appear immediately before or after the head it selects,[15] or before or after the phrase containing the head and all of its complements, but does not license the appearance of the adjunct within a group of complements.

Other characteristics of adjuncts are handled in this approach, however. A single lexical entry specifies the integration of an adjunct's semantics with the element it modifies. The difference between restrictive and operator adjuncts can be accommodated by variances in the definitions in the CONTEXT field of the adjunct's SYNSEM feature. Redundancy constraints are not explicitly accommodated, but could conceivably be implemented within the MOD feature of an adjunct in terms of restrictions on the modified head. It is not entirely clear, however, how this implementation would be accomplished.

Surface order and semantic precedence issues remain a stumbling block for the standard HPSG approach. Since linear precedence constraints (constraints defined in terms of obliqueness which control the surface order of elements relative to one another) apply at the level of individual phrases built by the ID schemata, and only one adjunct at a time can be attached to a head via an ID schema, the order of modification is constrained to surface order.

4.3   A "Semantic Obliqueness" hierarchy

Kasper (1994) proposes a treatment of adjuncts aimed specifically at handling Mittelfeld phenomena. He adopts the standard HPSG representation of adjuncts, in that the adjuncts specify the heads they modify via the MOD field and semantic integration occurs through

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[15]Note that this in fact does not constrain adjunctive placement enough, improperly allowing lexical heads rather than phrasal heads to be modified by an adjunct. This would therefore not rule out phrases such as *The king in the bath of France* or sentences like *John kicked in the park the ball*. These sentences must be ruled out via the lexical entries of the prepositions which select for nominal/verbal heads: a head with an empty SUBCAT list must be explicitly selected for in the MOD field of the preposition.

coindexing between parts of the CONTEXTs of the selected head and of the adjuncts themselves.

Kasper makes several relevant semantic assumptions. First, states of affairs (*soa*s) come in two basic kinds: those that are spatio-temporally located (*located-qfsoa*) and those that are not (*unlocated-qfsoa*). Second, the NUCLEUS of a state of affairs is split into a primary quantifier-free *soa* (*qfsoa*) and a set of restrictions. Multiple semantic restrictions with respect to the same state of affairs can thereby be specified in the restrictions set. This set plays a role analogous to the RESTRICTIONS feature on referential indices in the semantic content of nominal objects. Thus adverbials and adnominals can be treated in a parallel manner.

The *head-complement* structure of standard HPSG is extended by Kasper to include an ADJUNCT-DAUGHTERS attribute. This is a list of adjunct signs ordered in terms of a "semantic obliqueness" hierarchy, i.e. from widest to narrowest semantic scope.

To handle the syntax and semantics of adjunction, Kasper splits the MOD field of the adjuncts into two parts: a SYN attribute which indicates the syntactic category of the head with which the adjunct must combine and a SEM attribute specifying the semantic value to which the adjunct is applied. Kasper then specifies an *Adjunct Syntax Principle* requiring the MOD:SYN attribute of all signs on the ADJUNCT-DAUGHTERS list of a *head-complement* structure to be token-identical with the CAT value of the head daughter. Furthermore, his *Adjunct Semantics Principle* forces semantic composition to occur in terms of "semantic obliqueness" order: the element with narrowest scope is applied to the head's semantics, then the element with second-narrowest scope is applied to the resulting semantics, and so on down the list.

The relative surface order of complements and adjuncts would then have to be constrained by separate principles of constituent order which constrain the possible combinations of elements from the ADJUNCT-DAUGHTERS and COMP-DAUGHTERS attributes.

An issue which Kasper remains vague about is how elements are put onto the ADJUNCT-DAUGHTERS list. Apparently the HEAD-COMPLEMENT and HEAD-SUBJECT-COMPLEMENT schemata must be redefined to allow for arbitrary insertion of adjuncts into the ADJUNCT-DAUGHTERS list of the *head-complement* structure. What drives this insertion, however, remains unclear. Some mechanism must exist to identify all adjunctive sentence constituents, evaluate their relative "semantic obliqueness", and insert them into the list.

Since Kasper opts for a semantic obliqueness order on the ADJUNCT-DAUGHTERS list rather than an order reflecting surface order, semantic differences which depend on syntactic order may not be appropriately handled. The adjunct insertion mechanism discussed above must be defined in such a way as to take order effects into account. Furthermore, the mechanism must also provide for adjuncts which are not hierarchically related semantically (as in the case of restrictive adjuncts) so as to avoid analysis redundancies deriving from differences in order on the list.

It is observed by van Noord and Bouma (1994) that Kasper's approach cannot account for interpretation ambiguities in Germanic verb cluster constructions. These ambiguities occur because adjuncts are able to modify any verb within a verb cluster. Thus in the Dutch sentences in (70) (from van Noord and Bouma 1994) the adjuncts (*today, with the telescope*) can either be interpreted as having narrow scope and modifying the event introduced by the main verb or as having wide scope and modifying the event introduced by the auxiliary.

(70) a.   dat Arie vandaag Bob wil   slaan
                       that Arie today   Bob wants to hit
                       that Arie wants to hit Bob today

       b.   dat Arie Bob de vrouwen met een verrekijker zag bekijken
                       that Arie Bob the women with a   telescope   saw look at
                       that Arie saw Bob looking at the women with a telescope

Under the standard treatment of such clusters within a flat structure, the first auxiliary verb is treated as the head of the structure. Kasper's solution thus dictates that any adjuncts must modify this head rather than an embedded verb, not allowing for any narrow-scope readings.

4.4   The lexical rule approach

To solve the problem of accounting for the ambiguity of adjunctive modification in Germanic verb clusters, van Noord and Bouma (1994) propose a solution treating adjunction via a lexical rule. The lexical rule specifies the addition of a single adjunct to the SUBCAT list of a verb. The ambiguity in the verb cluster modification then derives from the possibility of the lexical rule applying to any verb in the cluster. In the narrow scope case the lexical rule applies to the embedded verb, placing the adjuncts on its subcat list. The subcat requirement will then be inherited by the head verb, but the semantics of the adjunct will be incorporated into the semantics of the embedded verb. In the wide scope case the adjunct is simply on the list of the head verb and its semantics applies to the head.

Use of standard lexical rule mechanisms, i.e. application of the lexical rules upon the lexicon in a 'precomputation' phase, would result in an infinite lexicon. Nothing could prevent the lexical rule from continuing to add additional adjuncts to a SUBCAT list ad infinitum. To avoid this problem, van Noord and Bouma propose instead to treat lexical rules as constraints on lexical categories and to use delayed evaluation techniques.[16]

These lexical category constraints are implemented as rules which must be satisfied by the lexical entry of a word in a particular category. The constraints are evaluated with respect to the base (or "stem") form of a word in the lexicon. The true lexical entry for the word used in an attempted parse results from evaluation of constraints with respect to the base form.

The delayed evaluation techniques prevent constraints from being evaluated until enough information is available to do so. This means that constraints may actually only be partially evaluated at any step in the application of multiple constraints to a single lexical entry. The benefit of these techniques is that parsing mechanisms can interact with lexical information, allowing constraints from both structural and lexical levels to apply simultaneously as input is processed.

The van Noord and Bouma approach accommodates most of the characteristics of adjuncts well. A single lexical entry is necessary for each adjunct, and they allow for both restrictive and operator adjuncts by requiring the appropriate semantic combinations to be specified in the MOD field of the adjunct, following Kasper's (1994) approach. Mittelfeld phenomena are handled by allowing for the insertion of the adjuncts at any point in the verbal subcat list.

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[16]These topics will only be discussed briefly in this paper. See van Noord and Bouma (1994).

It is noted by van Noord and Bouma that their approach is flexible enough to accommodate various approaches to the ordering of adverbials on the subcat list. Although the lexical constraint controlling the addition of adjuncts as defined in their paper assumes that the adjuncts are inserted into the subcat list in order of semantic obliqueness (adopting Kasper's idea of semantic combination from narrow to wide scope), there is nothing in their methodology which restricts the definition of the constraint. It is difficult to see precisely how syntactic ordering effects could be accommodated in an approach that relies entirely on semantic obliqueness. Changes in the ordering on the subcat list, however, would require radical changes in the existing definition of the constraint. In particular, if the ordering on the subcat list were changed to reflect the surface order of the adverbials, their recursive approach to semantic composition would no longer suffice. Other mechanisms, analogous to the linear precedence (LP) constraints which are required to handle word order restrictions in their existing approach, would be necessary to control semantic composition. These mechanisms could only be applied to a fully expanded subcat list and thus would prevent semantic content from being truly recursively computed.

Redundancy constraints are a problem in the van Noord and Bouma (1994) approach, as in all other approaches discussed here. They could conceivably be defined in the requirements in the MOD field specifications, but again it is not clear how to do this in a straightforward manner.

4.5   Conclusions

None of the existing approaches to the treatment of adjuncts provides a satisfactory framework for explaining surface order and semantic precedence effects. The standard HPSG approach makes no attempt to accommodate these effects whatsoever; the Kasper (1994) and van Noord and Bouma (1994) approaches both rely on unspecified principles for determining semantic precedence, and principles of constituent order to control the surface order of adjuncts. None of the approaches satisfactorily allows for interactions between these various principles. In the section that follows, I will attempt to develop a more satisfactory framework.

5   Representation and Methodology

The van Noord and Bouma (1994) treatment of adjuncts adopts the positive aspects of Kasper's (1994) treatment, integrating them into a framework which solves several problems with Kasper's original treatment. They accomplish this via a delayed-evaluation lexical rule approach to the incorporation of adjuncts. I will adopt this general approach, but will refine the semantic representation to show how it can be used to handle the phenomena of redundancy restrictions and adjunct combination restrictions. Additionally, a more explicit methodology for handling word order and semantic precedence constraints will be introduced.

5.1   Semantic representation

The semantic representation of a verb can essentially be divided into two components: *internal* and *external* semantics. The internal semantics of a verb reflects the meaning expressed

by the verb itself. This includes specification of the verb's semantic arguments and all of the relations involving these arguments: the roles they play, and any events/subevents which can be logically inferred from a use of the verb in a sentence. The external semantics reflects meaning particular to a particular situation expressed by the verb on a particular use. Examples of elements of external semantics include location, time, and thematic information (contributed to a situation by thematic adjuncts).

In Verspoor (1994), a representation for verb semantics based on work by Pinker (1989) and Jackendoff (1990) was presented. The purpose of the representation is provide a formal way of describing the semantic role verbal arguments play with respect to one another, the main event the verb expresses and any subevents which are also expressed by the verb. The traditional HPSG representation of semantics as predicate names plus semantic roles particular to the predicate is overridden by this more general semantic description. Predicate names do not explicitly appear at all within the representation.

The essential elements of the representation include a set of conceptual primitives corresponding to ontological categories, predicates which denote particular relations, and subordinating relations used to relate subevents (Table 1). Valid predicate–argument structures, built up with the representational elements, are defined in formation rules (Table 2).[17] A grammar for

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[17]The *time* marker allows for vague specifications of temporal relations among subevents, indicating the relative order in which the subevents occur rather than locating them at a specific point or interval in time.

Conceptual Constituents	
EVENT, STATE, THING, PLACE, PATH, PROPERTY, MANNER	
Predicate Definitions	
GO	an Event-function which denotes a Thing traversing a Path.
STAY	an Event-function which denotes stasis over a period of time; two arguments: the Thing standing still and its location (Place).
MOVE	an Event-function which specifies that a Thing moves.
ORIENT	a State-function specifying the orientation of a Thing with respect to a Path.
BE	a State-function for specifying the location (Place) of a Thing.
HAVE	a State-function which specifies a Thing which has (possesses) a Thing.
AFF	a State-function which specifies that an actor "affects" a patient.
Place Functions	
at, on, in, under ...	functions expressing location.
Path Functions	
to, from, via, away-from, toward	functions expressing direction.
Subordinating Relations	
effect, cause, despite, but, let, prevent, means, for_ to, obligates, fulfills	

Table 1: Representational Elements

the structure of the representation of verb semantics within the lexicon is specified (Table 3, where *SubordFunc* refers to an element of the set of subordinating relations and where the allowed STATEs and EVENTs are defined in the formation rules in Table 2). The action tier in a description expresses the actor/patient relationship, while the thematic tier expresses the causal relationships between the relation in the action tier and other occurrences (events or states) encompassed by a verb's semantics. The semantic descriptions allowed by the grammar correspond to the structure of the internal semantics.

The representational elements can also be used for external semantics with the addition of a formation rule to accommodate predicates with more complex arguments, such that an entire situation can be related to something in a particular way and subordinated events can be associated with a situation as a whole. Thus we might add the formation rule in (71).

(71)   [STATE] → [AFF (DESCRIPTION, THING, *time, manner*)]

Manner indicates how an actor acts or a theme changes during a particular state or event. This field is used, for example, to indicate the difference between walking and running: the GO-event which is a part of both will be specified for MANNER:walking in the case of *walk* and MANNER:running in the case of *run*.

$$
\begin{aligned}
[\text{EVENT}] \;\rightarrow\; &\left\{
\begin{array}{l}
[_{\text{EVENT}} \; \text{GO} \;(\; \text{THING} \;,\; \text{PATH} \;,\; time,\; manner \;)\;] \\
[_{\text{EVENT}} \; \text{STAY} \;(\; \text{THING} \;,\; \text{PLACE} \;,\; time \;)\;] \\
[_{\text{EVENT}} \; \text{MOVE} \;(\; \text{THING},\; time,\; manner \;)\;]
\end{array}
\right\} \\[2em]
[\text{STATE}] \;\rightarrow\; &\left\{
\begin{array}{l}
[_{\text{STATE}} \; \text{BE} \;(\; \text{THING} \;,\; \text{PLACE} \;,\; time \;)\;] \\
[_{\text{STATE}} \; \text{HAVE} \;(\; \text{THING} \;,\; \text{THING} \;,\; time \;)\;] \\
[_{\text{STATE}} \; \text{ORIENT} \;(\; \text{THING} \;,\; \text{PATH} \;,\; time \;)\;] \\
[_{\text{STATE}} \; \text{AFF} \;(\; \text{THING},\; \text{THING},\; time,\; manner \;)\;]
\end{array}
\right\} \\[2em]
[\text{PLACE}] \;\rightarrow\; &\left[_{\text{PLACE}} \; place\ function \;(\; \text{THING} \;) \right] \\[2em]
[\text{PATH}] \;\rightarrow\; &\left[_{\text{PATH}}
\left\{
\begin{array}{l}
\text{to} \\
\text{from} \\
\text{toward} \\
\text{away} - \text{from} \\
\text{via}
\end{array}
\right\}
\left(
\left\{
\begin{array}{l}
\text{THING} \\
\text{PLACE}
\end{array}
\right\}
\right)
\right]
\end{aligned}
$$

Table 2: Formation Rules

$$[\text{DESCRIPTION}] \quad \rightarrow \quad \left\{ \begin{array}{c} \text{STATE} \\ \text{EVENT} \\ \text{COMPLEX\_DESCRIPTION} \end{array} \right\}$$

$$[\text{COMPLEX\_DESCRIPTION}] \quad \rightarrow \quad \left[\begin{array}{c} \text{ACTION\_TIER} \\ \text{THEMATIC\_TIER} \end{array} \right]$$

$$[\text{ACTION\_TIER}] \quad \rightarrow \quad \left[{}_{\text{STATE}} \quad \text{AFF} \quad \left(\text{THING}, \quad \text{THING}, \quad \textit{time}, \quad \textit{manner} \right) \right]$$

$$[\text{THEMATIC\_TIER}] \quad \rightarrow \quad \left[\left\{ \begin{array}{l} SubordFunc_1 \left(\left\{ \begin{array}{c} \text{EVENT} \\ \text{STATE} \end{array} \right\} \right), \\ SubordFunc_2 \left(\left\{ \begin{array}{c} \text{EVENT} \\ \text{STATE} \end{array} \right\} \right), \\ \vdots \end{array} \right\} \right]$$

Table 3: Semantic Description Grammar

5.2 Implementation of the representation within HPSG

To accommodate a modified semantic representation within an HPSG grammar, a new sub-type of the type *qfpsoa, sem-desc*, is introduced, as described in detail in Verspoor (1994).[18] This type corresponds to DESCRIPTION in the semantic description grammar in Table 3 above. The definitions in the sort hierarchy for the subtypes of *sem-desc*, the features for which they are defined, and the values of these features follow the semantic description grammar. The subtypes of this type are therefore *state* and *event*, which in turn have subtypes defined according to the possible states and events as introduced in the formation rules in Table 2 above, and *complex-desc*. The latter is defined for an ACTION feature with value of type *aff-state* (affecting state, a subtype of *state*), and a THEMATIC feature which is a set of thematic elements. Thematic elements are in turn defined as having features for the subordinating relation and a subordinated *description*.

A sample HPSG lexical entry, for the verb *pay* in the sense of (72), can be found in (73) on page 254. The semantics expressed in this entry, as applied to (72), can be paraphrased as *John affects $100 at some time$_o$ in no particular manner with the effect that $100 goes to Mary, also at time$_o$*.

The phonological (PHON) feature has as its value the written word to which the entry corresponds, for lack of a more precise phonological transcription. The SYNSEM feature contains the syntactic and semantic information associated with the word being represented. Only the LOCAL information is relevant, specifically the CATEGORY and CONT (content) information. CATEGORY includes the HEAD features of the verb, all of the features defining the form of the verb and how it can be used (AUX specifies whether the verb is an auxilliary verb, INV

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[18]Note that the description here has been slightly simplified from the actual implementation, for purposes of clarity. See Verspoor (1994) for all details.

(72)   John paid $100 to Mary.

(73) a.

$$
\left[
\begin{array}{l}
\text{PHON} \quad pay \\[4pt]
\text{SYNSEM} \left[\text{LOCAL} \left[
\begin{array}{l}
\text{CATEGORY} \left[
\begin{array}{l}
\text{HEAD} \quad verb \left[
\begin{array}{ll}
\text{VFORM} & bse \\
\text{AUX} & minus \\
\text{INV} & minus \\
\text{MOD} & none \\
\text{PRD} & bool
\end{array}
\right] \\[4pt]
\text{MARKING } unmarked \\
\text{SUBCAT} \quad \left\langle NP_{\boxed{1}},\ NP[acc]_{\boxed{2}},\ \text{to } NP[acc]_{\boxed{3}} \right\rangle
\end{array}
\right] \\[6pt]
\text{CONT} \left[
\begin{array}{l}
\text{NUCLEUS } \boxed{6} : \text{(see (73b) below)} \\
\text{QUANTS} \quad e\_list
\end{array}
\right]
\end{array}
\right] \right]
\end{array}
\right]
$$

b. $\boxed{6}$:

$$
\left[
\begin{array}{l}
\text{ACTION} \left[
\begin{array}{l}
\text{AFUNC} \quad aff\_func \\[4pt]
\text{ARG1} \left[
\begin{array}{l}
\text{INDEX } \boxed{1} \\
\text{RESTR } e\_set
\end{array}
\right] \\[4pt]
\text{ARG2} \quad \boxed{4} : \left[
\begin{array}{l}
\text{INDEX } \boxed{2} \\
\text{RESTR} \left\{ \left[
\begin{array}{l}
\text{NUCLEUS} \left[
\begin{array}{l}
money \\
\text{INST} \quad \boxed{2}
\end{array}
\right] \\
\text{QUANTS} \quad list\_quant
\end{array}
\right] \right\}
\end{array}
\right] \\[4pt]
\text{TIME} \quad \boxed{5} : time\_0 \\
\text{MANNER } no\_manner
\end{array}
\right] \\[8pt]
\text{THEMATIC} \left\{ \left[
\begin{array}{l}
\text{AFUNC } effect \\[4pt]
\text{ARG1} \left[
\begin{array}{l}
\text{AFUNC } go\_func \\
\text{ARG1} \quad \boxed{4} \\[4pt]
\text{ARG2} \left[
\begin{array}{l}
\text{AFUNC } to\_path \\
\text{ARG1} \left[
\begin{array}{l}
\text{AFUNC} \quad at\_place \\
\text{ARG1} \left[
\begin{array}{l}
\text{INDEX } \boxed{3} \\
\text{RESTR } e\_set
\end{array}
\right] \\
\text{TIME} \quad \boxed{5} \\
\text{MANNER } no\_manner
\end{array}
\right]
\end{array}
\right]
\end{array}
\right]
\end{array}
\right] \right\}
\end{array}
\right]
$$

specifies whether the verb can appear in inverted form, MOD contains verb modifier information, PRD specifies whether the verb is predicative). The CATEGORY also contains a MARKING feature which indicates whether the verb is being used within a complementized clause (see Pollard and Sag 1994, pp. 45-47), and the SUBCAT feature which has a list of synsem objects, corresponding to the SYNSEM values of the signs with which the verb must combine to become "saturated".

The CONT (content) field has two features: the NUCLEUS, containing the core of the semantic information, and QUANTS, used in the HPSG treatment of quantification (see Pollard and Sag 1994, ch. 8). The value of the nucleus field in this work differs dramatically from what appears in Pollard and Sag's original HPSG work. It is where the semantic representation described in the previous paragraphs is integrated into HPSG.

The value of the NUCLEUS feature reflects the semantic structure of the verb. The example shown above shows a complex semantic structure, consisting of both an action and a thematic tier. The value of the ACTION feature is an *aff-state* entity, which specifies the AFF function as the main function, and restricts the two arguments of this function to be of type *thing*. Additionally, the features MANNER, and TIME are specified for this function. In the example, there is only one subordinated event in the thematic tier, and it is a *go-event* entity, specified for MANNER:*no_ manner*, subordinated by the *effect* subordinating function. Other verbs with more subordinated occurrences simply will have more elements specified in the THEMATIC set.

5.3 Changes to the Verspoor (1994) implementation

5.3.1 The sort hierarchy

In the Verspoor (1994) implementation, there was no distinction between internal and external semantics. The semantics represented in the NUCLEUS of a verbal lexical entry was purely its internal semantics. For the purposes of the treatment of adjuncts, however, it is necessary to introduce this distinction.

In order to represent both internal and external semantics, the sort hierarchy must be rearranged. *Qfpsoa* is divided into *restricted-soa* (*rsoa*) and (unrestricted) *soa*. The former will be defined for an attribute RESTRICTION, whose value is a set of restrictions of type *psoa*. *Situated-description* (*sit-desc*) is then made a subtype of *rsoa*, while operator adverbials become subtypes of *soa* (*cause-soa*, etc). A *sit-desc* is defined for attributes INTERNAL, with value of type *desc*, and EXTERNAL, with value of type *ext-desc*. It is a *sit-desc* structure which is associated with each verb in the lexicon, and in which the verb's internal semantics is held distinct from other kinds of semantics.

A basic type *sem-objs* is introduced. The two semantic objects − *desc*, corresponding to DESCRIPTION in the semantic description grammar in Table 3 as introduced above, and a new type *external-descriptions* (*ext-desc*) − are made to be subtypes of this type. Objects of type *ext-desc* are defined for attributes reflecting external elements of a situation. Following Kasper (1994), *ext-desc* is divided into two subtypes: *loc-desc*, defined for attributes LOCATION and TIME,[19] and *unloc-desc*, not defined for either attribute.

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[19] I have not explored the representation of temporal information and will leave the precise definition of the TIME attribute unspecified.
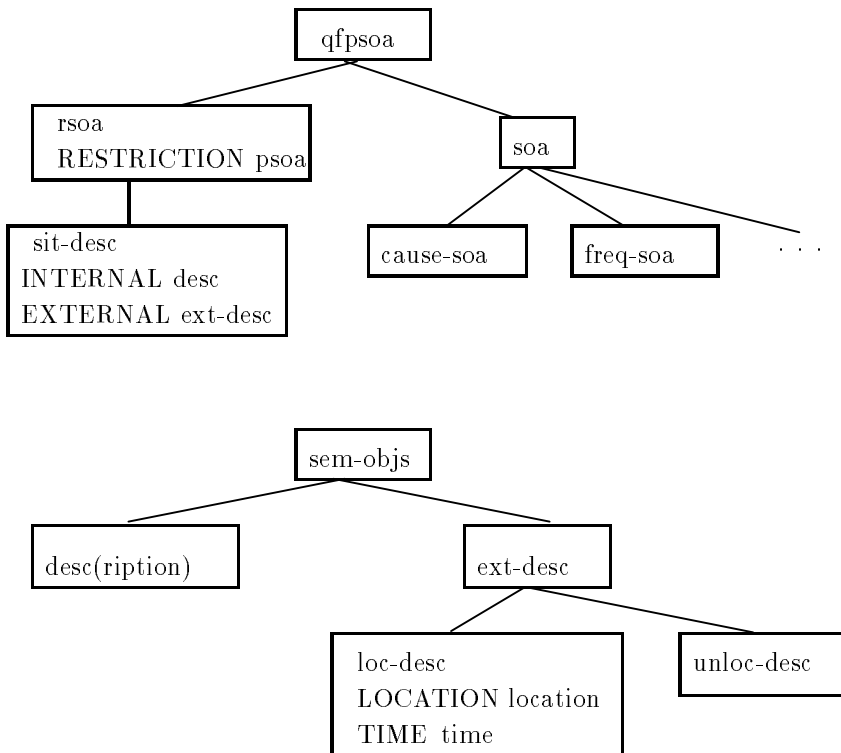
Figure 1: Type hierarchy for some semantic elements

The types as described above are summarized in Figure 1.

5.3.2   PP types

Thematic prepositional phrases add information to a situation which can be related to the situation via subordinating relations. In general only one thematic PP adding a given type of information can appear in a sentence, as is clear from the discussion in Sections 2.1.2 and 4.1.4. This redundancy restriction can be handled by defining objects of type *ext-desc* to have no more than one attribute corresponding to a particular thematic PP type.

In addition, it is important to track exactly which types of PPs have already appeared in the sentence in order to rule out sentences such as (74) in which the semantic content of the PPs is token-identical.

(74)   *Peter reads well because of the tutoring because of the tutoring.   [cf. (63)]

In a lexical rule approach using a sort hierarchy in which objects of type *ext-desc* are defined to have a single attribute per thematic adjunct type (that is, *ext-desc* objects are defined to have one feature for each of the possible subordinating relations), the lexical rule would simply require the content of an adjunct PP to be token-identical with the value of the corresponding thematic attribute in the verb's external semantic content. This approach is incapable of ruling out sentences like (74).

Figure 2: Segment of the sort hierarchy

The approach that will be taken here is inspired by the subsumption hierarchy defined in Wechsler (1994) for sorting psoas according to valency. First, a type *thematic* will be defined as a subsort of *qfpsoa*. All objects of type *ext-desc* will be defined for an attribute THEMATIC with *thematic* value. The most general *thematic* object is not defined for any PP types. Each subtype of this object will be defined for one or more modifying PP type. Part of the sort hierarchy appears in Figure 2.
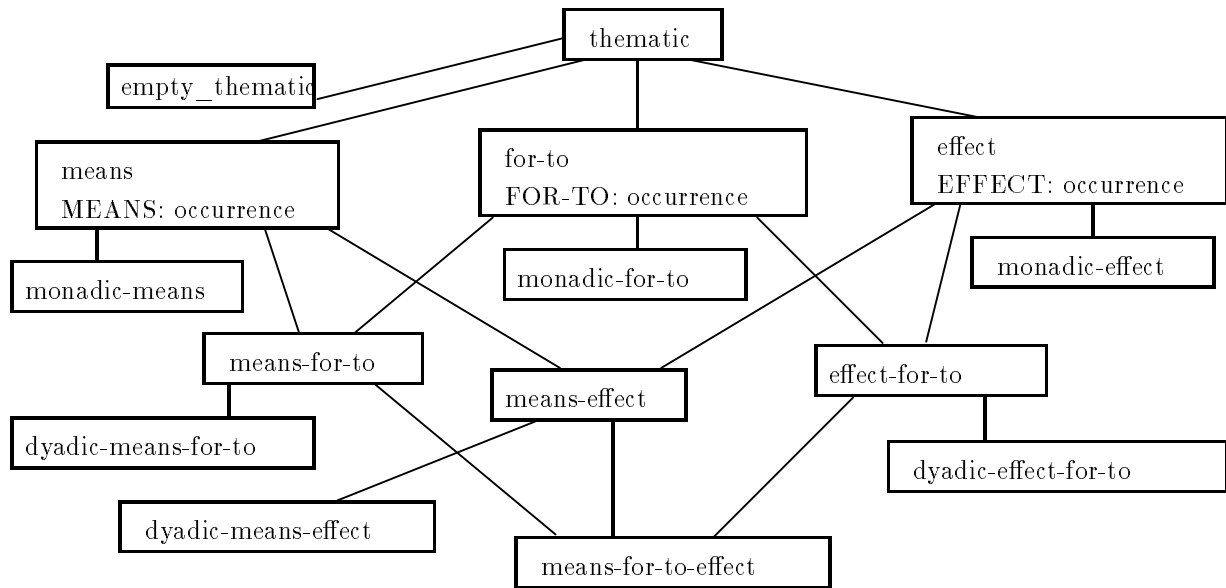
The advantage of such a hierarchical type structure is that the type of the THEMATIC element associated with the external semantics of a situation reflects precisely which PPs have already been added. As each PP is added to the verb's subcat list via a lexical rule, the semantics associated with the PP – a thematic object of type *means, for-to, effect*, etc. – will be unified with the THEMATIC attribute of the external semantics associated with the verb, thereby making the type of this attribute more specific. The lexical rule can enforce that the type is not already a subtype of the thematic type of the PP to be added, thereby preventing redundant thematic PPs.

The approach presented here also would allow any restrictions on the combinations of thematic PPs which can occur (not investigated in this context, but a possibility) to be simply implemented via missing links in the *thematic* type hierarchy. This avoids the use of mechanisms such as searching down the SUBCAT list for preceding elements in lexical rules which would be responsible for the enforcement of such combination restrictions.

The sort hierarchy introduced above will be utilized not only for the EXTERNAL:THEMATIC attribute, but will also replace the definition of INTERNAL:THEMATIC (corresponding to the THEMATIC_TIER in the semantic description grammar in Table 3). Thus the latter will no longer be a set of subordinating relations and the corresponding subordinated occurrence; it will simply be an object of type *thematic*. This allows for a general treatment of thematic elements, regardless of whether they appear at the internal semantics or the external semantics level.
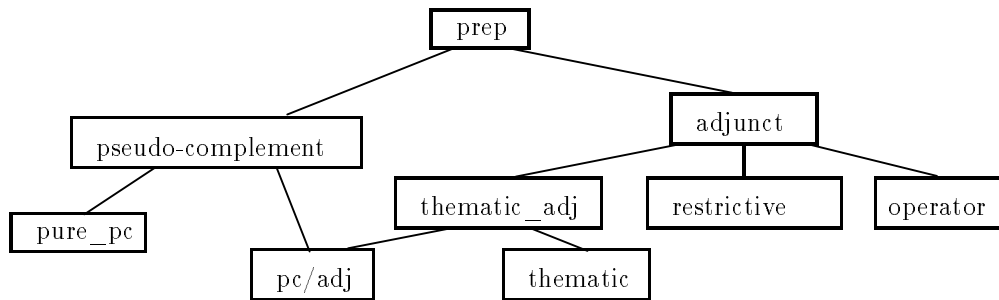
Figure 3: Preposition types in sort hierarchy

5.4   Adjunct semantics

The form of the lexical entries for adjuncts used in this approach relies on the semantic representation introduced in Section 5.1. The MOD field of an adjunct is used as the main vehicle for identification of the type of object which the adjunct can modify. Specification of the type of the adjunct is, however, also crucial. The definition of the lexical rules depends upon this specification.

Kasper's (1994) splitting of the MOD field into syntactic and semantic parts is unnecessary in a lexical rule approach. Since the adjuncts are added directly to the SUBCAT list of the element they modify, the lexical rules account for the appropriate structure sharing between the SYNSEM specified in every adjunct's MOD field and the modified "head".[20] In fact, the lexical rule approach to adjunct modification even eliminates the need for HPSG's *Head-Adjunct Schema* (schema 5) and the complex definition of a semantic head (Pollard and Sag 1994, p. 322) – adjunctive elements are essentially given the status of subcategorized elements and the differences in how the semantics of the different types of adjuncts interacts with the semantics of the modified phrase are handled directly in the rules. The verb therefore remains the semantic head of the sentence, and all phrases with complements and (possibly) adjuncts are licensed by the *Head-Complement Schema.*

In Section 3.3 it was proposed to divide prepositions into three types, reflecting their behaviour as strictly a pseudo-complement, strictly a true adjunct, or a preposition which can behave as both. In fact, more types are necessary, to capture the difference between restrictive, operator, and thematic adjuncts. The relevant piece of the type hiearchy appears in Figure 3.

I will provide representative lexical entries for each of these types. The pure pseudo-complement *to* is shown in (75). This type of preposition adds an *effect* thematic element to the internal semantics associated with a situation (see Section 3.2.2). The lexical entry need only specify this thematic element and the basic semantic structure of the modified verb. Structure sharing between the semantics of the prepositional phrase and the INTERNAL:THEMATIC attribute of the situation is specified in the lexical rule bringing about the modification. This is because

---

[20]Note that it is necessary to interpret the MOD field as specifying a particular type of element with which an adjunct can combine, rather than necessitating that the adjunct modify a phrasal head. This is because the head of a phrase may not be the element in the phrase which the adjuncts actually modifies, as was evidenced by the verb cluster data in Section 4.3.

this aspect of modification remains constant across prepositions of this type.

$$
(75)\quad
\begin{bmatrix}
\text{PHON} & to \\[2pt]
\text{SYNSEM:LOC} &
\begin{bmatrix}
\text{CAT} &
\begin{bmatrix}
\text{HEAD} &
\begin{bmatrix}
\text{MOD:LOC} &
\begin{bmatrix}
\text{CAT:HEAD} & verb \\[2pt]
\text{CONT:NUC} &
\begin{bmatrix}
\text{INT} &
\begin{bmatrix}
\text{ACTION} &
\begin{bmatrix}
\text{AFUNC} & \mathit{aff\_func} \\
\text{ARG1} & thing \\
\text{ARG2} & thing
\end{bmatrix} \\[10pt]
\text{THEM} & thematic
\end{bmatrix} \\[6pt]
\text{EXT} & \textit{ext-desc}
\end{bmatrix}
\end{bmatrix} \quad p\_pc
\end{bmatrix} \\[20pt]
\text{SUBCAT} & \left\langle \text{NP}_{\boxed{1}} \right\rangle
\end{bmatrix} \\[30pt]
\text{CONT} &
\begin{bmatrix}
\text{NUC} &
\begin{bmatrix}
\text{THEM-ARG} & \boxed{2} \\[4pt]
\text{EFFECT} &
\begin{bmatrix}
\text{AFUNC} & \mathit{go\_func} \\
\text{ARG1} & \boxed{2} \\[6pt]
\text{ARG2} &
\begin{bmatrix}
\text{AFUNC} & to \\
\text{ARG1} &
\begin{bmatrix}
\text{AFUNC} & at \\
\text{ARG1} & \boxed{1} \\
& place
\end{bmatrix} \\
& path
\end{bmatrix}
\end{bmatrix}
\end{bmatrix} \\
& thematic
\end{bmatrix}
\end{bmatrix}
\end{bmatrix}
$$

The lexical entry for *by*, a thematic adjunct, is shown in (76). The sense of *by* expressed here is that in *John broke the lock by hitting it with a hammer*. This type of preposition adds a thematic element to the external semantics associated with a situation. As above, the lexical entry need only specify this thematic element and the basic semantic structure of the modified verb, as the appropriate structure sharing between the semantics of the modified verb and the semantics of the preposition is accomplished in the lexical rule. In this case, the thematic element expresses the particular means through which the situation is accomplished. It also expresses an additional constraint that the actor of the embedded VP be token-identical with the actor in the main situation.

(76)

$$
\left[
\begin{array}{l}
\text{PHON} \quad \textit{by} \\
\text{SYNSEM:LOC}
\left[
\begin{array}{l}
\text{CAT}
\left[
\begin{array}{l}
\text{HEAD}
\left[
\begin{array}{l}
\text{MOD:LOC}
\left[
\begin{array}{l}
\text{CAT:HEAD } \textit{verb} \\
\text{CONT:NUC}
\left[
\begin{array}{l}
\text{INT}
\left[
\begin{array}{l}
\text{ACTION}
\left[
\begin{array}{ll}
\text{AFUNC} & \textit{aff\_func} \\
\text{ARG1} & \boxed{1} \\
\text{ARG2} & \textit{thing}
\end{array}
\right] \\
\text{THEM} \quad \textit{thematic}
\end{array}
\right] \\
\text{EXT } \textit{ext-desc}
\end{array}
\right]
\end{array}
\right]
\end{array}
\right]_{th\_adj} \\
\text{SUBCAT } \langle \text{VP} : \boxed{2} \rangle
\end{array}
\right] \\
\text{CONT}
\left[
\text{NUC}
\left[
\begin{array}{l}
\text{MEANS } \boxed{2} : \left[\text{INT:ACTION}
\left[
\begin{array}{ll}
\text{AFUNC} & \textit{aff\_func} \\
\text{ARG1} & \boxed{1}
\end{array}
\right]
\right]
\end{array}
\right]_{thematic}
\right]
\end{array}
\right]
\end{array}
\right]
$$
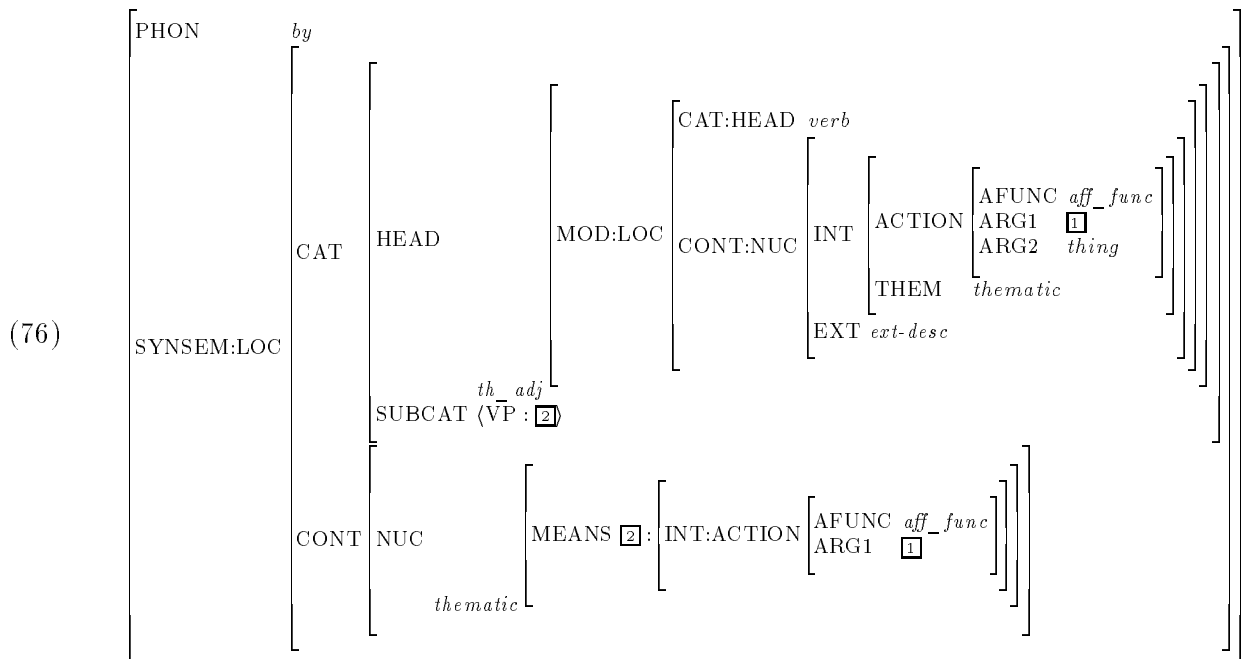
The lexical entry for *for*, which can behave as both a pseudo-complement and an adjunct, is shown in (77).

(77)

$$
\left[
\begin{array}{l}
\text{PHON} \quad \textit{for} \\
\text{SYNSEM:LOC}
\left[
\begin{array}{l}
\text{CAT}
\left[
\begin{array}{l}
\text{HEAD}
\left[
\begin{array}{l}
\text{MOD:LOC}
\left[
\begin{array}{l}
\text{CAT:HEAD } \textit{verb} \\
\text{CONT:NUC}
\left[
\begin{array}{l}
\text{INT}
\left[
\begin{array}{l}
\text{ACTION}
\left[
\begin{array}{ll}
\text{AFUNC} & \textit{aff\_func} \\
\text{ARG1} & \textit{thing} \\
\text{ARG2} & \textit{thing}
\end{array}
\right] \\
\text{THEM} \quad \textit{thematic}
\end{array}
\right] \\
\text{EXT } \textit{ext-desc}
\end{array}
\right]
\end{array}
\right]
\end{array}
\right]_{pc/adj} \\
\text{SUBCAT } \langle \text{NP}_{\boxed{1}} \rangle
\end{array}
\right] \\
\text{CONT}
\left[
\text{NUC}
\left[
\begin{array}{l}
\text{THEM-ARG } \boxed{2} \\
\text{FOR\_TO}
\left[
\begin{array}{ll}
\text{AFUNC} & \textit{aff\_func} \\
\text{ARG1} & \boxed{2} \\
\text{ARG2} & \boxed{1}
\end{array}
\right]
\end{array}
\right]_{thematic}
\right]
\end{array}
\right]
\end{array}
\right]
$$
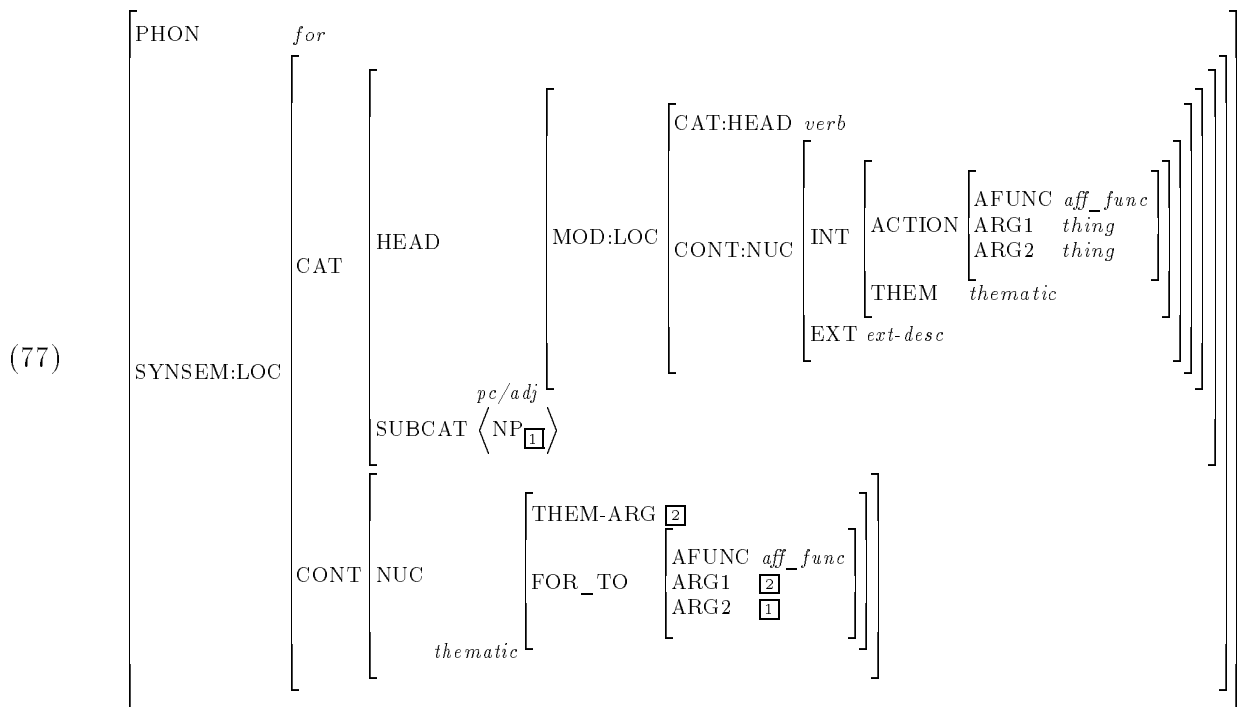
This type of preposition adds a thematic element to either the internal or the external semantics associated with a situation, depending on how it is used in a particular utterance (see Section 3.2.1). Again, the lexical entry need only specify the thematic element and the basic semantic structure of the modified verb. Either the lexical rule for pseudo-complements

or the lexical rule for thematic adjuncts will be applied to incorporate this adjunct into a sentence. Which rule is used determines where the thematic element is attached.

The lexical entries in (75)-(77) make use of a semantic element, THEMATIC-ARG, defined for all objects of type *thematic*, which has not yet been explained. This element is a result of the distinctions between pseudo-complements and adjuncts as introduced in Section 3.2. Both types of prepositions express a relation which subordinates a state or event. The relation expressed may contain an argument which in the case of pseudo-complements is also a verbal semantic argument, and in the case of true adjuncts is tied to the internal semantics as a whole. In order to allow prepositions which can behave as both pseudo-complements and as adjuncts to be represented by a single lexical entry, it is necessary to come up with a way to allow this argument position to be structure-shared with the appropriate semantic element regardless of which particular type of modification occurs on a particular use of the preposition.

This is accomplished by specifying structure-sharing between the variable argument position in the subordinated event and the THEMATIC-ARG attribute in the SYNSEM:LOC:CONT:NUC field of the lexical entry, and through definition of constraints on objects controlling structure-sharing between the THEMATIC-ARG element and other semantic elements, shown in (78)-(79). It obviously also relies on the treatment of both the internal and external thematic components as objects of type *thematic*. If a whole THEMATIC structure is unified with an INTERNAL:THEMATIC element, the THEMATIC-ARG is forced to be structure-shared with the second argument in the ACTION tier, as controlled by a constraint defined for an object of type *complex-sem*, shown in (78). Similarly, a constraint is defined for objects of type *sit-desc* as shown in (79). This constraint ensures that if a THEMATIC structure is unified with a EXTERNAL:THEMATIC element, the THEMATIC-ARG is forced to be structure-shared with the full internal semantics.

$$
(78) \quad \begin{bmatrix} \text{INTERNAL} & \begin{bmatrix} \text{ACTION} & \begin{bmatrix} \text{AFUNC} & \textit{aff\_func} \\ \text{ARG1} & \textit{thing} \\ \text{ARG2} & \boxed{1} \end{bmatrix} \\ \text{THEM} & \begin{bmatrix} \text{THEM-ARG} & \boxed{1} \end{bmatrix} \end{bmatrix} \end{bmatrix}
$$

$$
(79) \quad \begin{bmatrix} \text{INTERNAL} & \boxed{1} \\ \text{EXTERNAL} & \begin{bmatrix} \text{THEM:THEM-ARG} & \boxed{1} \end{bmatrix} \end{bmatrix}
$$

The lexical entry for the restrictive preposition *in*, as in *John ran in the park* is shown in (80). This definition follows that of Kasper (1994), specifying the restriction of an index picked out from the verb semantics. The semantic effect of a simple locative adverbial such as *in* is only to add a restriction on the LOCATION index associated with the situation – in this case, the location of the situation must be spatially included within ($\subseteq$) *the park*. The union of this restriction with any existing restrictions allows for the possibility of multiple restrictive PPs within a single sentence. Note also that this lexical entry utilizes the standard HPSG approach to semantic specification, as the SYNSEM:LOC:CONT:NUC attribute of the entry specifies the full *sit-desc* to be associated with the sentence. Thus the lexical rule will

specify the replacement of the semantics associated with the sentence by this *sit-desc*, in effect allowing this PP to become the semantic head of the sentence. Since this aspect of the semantics is controlled by the lexical rules, however, it does not need to be addressed in the schemata controlling phrase structure (see Section 5.4).

$$
(80) \quad
\begin{bmatrix}
\text{PHON} & \textit{in} \\
\text{SYNSEM:LOC} &
\begin{bmatrix}
\text{CAT} &
\begin{bmatrix}
\text{HEAD} &
\begin{bmatrix}
\text{MOD:LOC} &
\begin{bmatrix}
\text{CAT:HEAD} & \textit{verb} \\
\text{CONT:NUC} &
\begin{bmatrix}
\text{INT} & \boxed{1} \\
\text{EXT} & \boxed{4} : \begin{bmatrix}\text{LOCATION} & \boxed{2}\end{bmatrix} \\
\text{RESTR} & \boxed{5}
\end{bmatrix}
\end{bmatrix}
\end{bmatrix} \textit{restr} \\
\text{SUBCAT} \langle \text{NP} : \boxed{3} \rangle
\end{bmatrix} \\
\text{CONT} &
\begin{bmatrix}
\text{NUC} &
\begin{bmatrix}
\text{INT} & \boxed{1} \\
\text{EXT} & \boxed{4} \\
\text{RESTR} & \{\boxed{2} \subseteq \boxed{3}\} \cup \boxed{5}
\end{bmatrix}
\end{bmatrix}
\end{bmatrix}
\end{bmatrix}
$$

An approximated representation for the operator preposition *because_ of*, as in *Peter reads well because of the lessons*, is shown in (81). This also follows Kasper's (1994) treatment of operator adverbials. Here the semantic content of the modified VP appears as an argument of the *cause-soa*, reflecting the behaviour of operator adjuncts as adjuncts which predicate something of the content they modify.

$$
(81) \quad
\begin{bmatrix}
\text{PHON} & \textit{because\_of} \\
\text{SYNSEM:LOC} &
\begin{bmatrix}
\text{CAT} &
\begin{bmatrix}
\text{HEAD} &
\begin{bmatrix}
\text{MOD:LOC} &
\begin{bmatrix}
\text{CAT:HEAD} & \textit{verb} \\
\text{CONT:NUC} & \boxed{1}
\end{bmatrix}
\end{bmatrix} \\
\text{SUBCAT} \langle \text{NP} : \boxed{2} \rangle \textit{op}
\end{bmatrix} \\
\text{CONT} &
\begin{bmatrix}
\text{NUC} &
\begin{bmatrix}
\text{CAUSE} & \boxed{2} \\
\text{CAUSED} & \boxed{1}
\end{bmatrix}
\end{bmatrix}
\end{bmatrix}
\end{bmatrix}
$$

5.5   The OP-ADJUNCTS feature

Both the Kasper (1994) and the van Noord and Bouma (1994) approaches generate a list on which adjuncts theoretically appear in order of their semantic obliqueness. Surface order of these adjuncts is then controlled by separate principles of constituent order. The motivation behind building these lists in terms of semantic obliqueness lies in the compositional approach to semantic interpretation in the two approaches.

The problem with these approaches is that they cannot easily account for the interaction between semantic scope of modification and surface order. Furthermore, it is not clear in either approach how or when the relative semantic obliqueness of adjuncts on these lists is determined. In the Kasper (1994) approach, a mechanism must exist which drives the insertion of elements into the ADJ-DTRS list, although it is not explicitly specified. This mechanism must also be responsible for evaluating the relative semantic obliqueness of inserted elements. It is not at all obvious how the surface order of the elements would be taken into account in this evaluation.

The van Noord and Bouma (1994) approach assumes that the parser hypothesizes a structure for the SUBCAT list of the head of a phrase which is evaluated against the constraints captured in the lexical rules. The hypothesized SUBCAT list must therefore reflect consultation of linear precedence rules imposed upon the parser. These linear precedence rules must be able to generate a SUBCAT list arranged in terms of semantic obliqueness from the surface order of the elements. Once the SUBCAT list is hypothesized to be a list of elements in a certain order, the lexical rules adding adjuncts to the subcat list act to perform the appropriate semantic integration of the adjuncts into the overall representation of the verb semantics. Because the system treats these rules as constraints to be verified, no mechanisms controlling the relative order of adjuncts on the SUBCAT list need be applied at the level of the rules. These mechanisms would be redundant.

This general approach is quite interesting, and effectively handles the word-order effects on the adjunct semantics if the linear precedence constraints are defined correctly. However, it is difficult to imagine how these constraints would be defined given that they would have to accommodate all variances in surface order among all adjunct types.

The approach presented here will restrict the domain of the constraints controlling semantic obliqueness to operator adjuncts. The constraints only need to take into account the relative semantic order of operator adjuncts, and will thus be easier to define. This restriction is possible since all other types of adjuncts provide information which actually modifies only the main *sit-desc* object associated with a verb. For example, in the sentences in (82), the "John-jogged" event is what is located in the park, regardless of the position of the restrictive PP relative to the operator adjuncts. It is not the "twenty-minutes-duration (John-jogged)" event which is located in the park, as would be suggested by (82b), or the "twice-daily (twenty-minutes-duration (John-jogged))" event which is located in the park, as suggested by (82c). All three of these sentences should have the interpretation "twice-daily (twenty-minutes-duration (in-park (John-jogged)))". Thus the semantic contribution of the restrictive adjunct must be incorporated before the operations specified by the operator adjuncts are processed.

(82) a.   John jogged in the park for twenty minutes twice a day.

      b.   John jogged for twenty minutes in the park twice a day.

      c.   John jogged for twenty minutes twice a day in the park.

Neither of the van Noord and Bouma (1994) and Kasper (1994) approaches handles this phenomena appropriately. Both approaches will give rise to errors in the semantic representation associated with a sentence containing interspersed operator and other adjuncts – namely that

the restrictive or thematic adjuncts will be seen as modifying complex operator SOAs rather than the main SOA expressed by a sentence − because they do not postpone evaluation of operator adjuncts until after the other types.

Because all adjuncts other than operator adjuncts provide information relevant to the main *sit-desc* associated with a verb, the semantic contribution made by these adjuncts can be incorporated into the structure representing the semantics of the situation being modified as soon as they are encountered (i.e. as soon as the adjuncts are inserted into the SUBCAT list of the modified word by a lexical rule). On the other hand, operator adjuncts must always be processed after all other adjuncts, as evidenced by the example above.

To accommodate this difference between operator adjuncts and other adjuncts, a distinction is made in the current approach between the treatment of operator adjuncts and the treatment of other adjuncts. In the lexical rules controlling the treatment of all types of adjuncts other than operator adjuncts, the semantic contribution of these adjuncts is incorporated into the representation of the semantics of the situation immediately. For operator adjuncts, however, incorporation of their semantic contribution is postponed until after all adjuncts have been inserted into the SUBCAT list.

As operator adjuncts are added to the SUBCAT list in a lexical rule, they are also added to an OPERATOR-ADJUNCTS (OP-ADJ) list associated with the SYNSEM:CAT of the lexical element whose SUBCAT list is being manipulated. This is used in the handling of semantic status and surface order interactions.

The approach involves keeping track of both surface order and relative semantic obliqueness of operator adjuncts. Following van Noord and Bouma (1994), the application of the lexical rules will be driven by a structure for the SUBCAT list as proposed by the parser. However, this structure will reflect the natural surface order of the adjuncts rather than incorporating any evaluation of their semantic obliqueness. Thus linear precedence constraints on the parser will simply require that all adjuncts appear after the complements on the subcat list, with the adjuncts in surface order. The evaluation of semantic obliqueness will occur when an operator adjunct is added to the subcat list in a lexical rule. The evaluation function will be given the existing OP-ADJ list and the new element, and then must determine the placement of the new element onto the list. This function will be able to take into consideration the relative surface order of the operator adjuncts, as any adjunct which it is attempting to insert into the OP-ADJ list must appear later in the surface order than any elements already on the list.

After all operator adjuncts have been inserted into the OP-ADJ list, and the semantic contribution of all other adjuncts has been integrated into the semantic representation for the situation as a whole, the semantics of the operator adjuncts can be processed. The OP-ADJ list will contain all of the operator adjuncts, listed from narrowest to widest scope. The function *process_op_adjs* will essentially accomplish what Kasper's (1994) *Adjunct Semantics Principle* does, but then only for operator adjuncts: the MOD:LOC:CONT:NUC value of the adjunct of narrowest scope will be made token identical to the *sit-desc* object representing the situation. Then, if there are $n > 1$ elements on the OP-ADJ list, the MOD:LOC:CONT:NUC value of OP-ADJ$_i$ is token-identical with the SYNSEM:LOC:CONT:NUC value of OP-ADJ$_{i-1}$ for all i between 2 and n. The result of this processing is a semantic value which then becomes the semantics associated with the sentence as a whole.

In sum, the approach proposed here differentiates between operator and other adjunct types, integrating the semantics of other adjunct types immediately and postponing the semantic integration of operator adjuncts. This results in an appropriate representation of the semantics of sentences in which adjunct types are interspersed, and reflects the fact that only the semantic obliqueness of operator adjuncts relative to one another (but not to other adjunct types) plays a role in interpretation. The approach also allows the surface order of adjuncts to influence the evaluation of semantic obliqueness in a more straightforward manner by allowing the SUBCAT list to reflect their surface order.

5.6   Lexical rules

The approach presented here requires there to be different lexical rules for different types of adjunction. Each rule allows for the integration of semantics and structure-sharing between modifier and modified appropriate to the relevant type of adjunction. The design of the rules essentially follows that of van Noord and Bouma (1994), in that the *add_adj_control* rule builds an output structure based on the input structure it receives, by relying on other rules to modify elements of the structure in appropriate ways. The rules are described and presented below. Note that the subsort check needed to prevent redundant thematic PPs is not explicitly represented.

- Controlling rule: allows for the addition of all adjuncts to the element's SUBCAT list, and the processing of all operator adjuncts. The first argument is the original *synsem* object input, the second argument is the *synsem* object which results after all adjuncts have been added and processed. This rule calls *process_op_adjs*, which is responsible for processing the semantic contribution of the operator adjuncts.
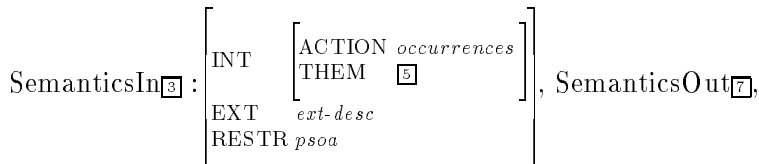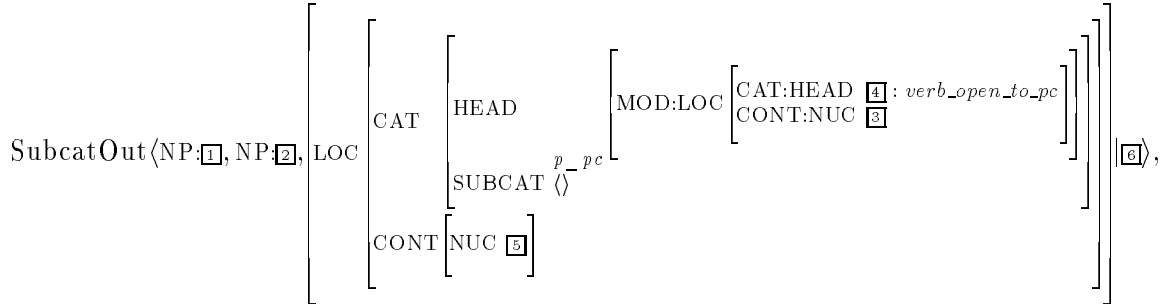
$$
\text{add\_adj\_control}(
\begin{bmatrix}
\text{LOC} \begin{bmatrix}
\text{CAT} \begin{bmatrix}
\text{HEAD} & Head[1] \\
\text{SUBCAT} & SubcatIn[2] \\
\text{OP-ADJ} & \langle\rangle
\end{bmatrix} \\
\text{CONT} \begin{bmatrix} \text{NUC} & SemanticsIn[3] \end{bmatrix}
\end{bmatrix}
\end{bmatrix},
\begin{bmatrix}
\text{LOC} \begin{bmatrix}
\text{CAT} \begin{bmatrix}
\text{HEAD} & Head[1] \\
\text{SUBCAT} & SubcatOut[4] \\
\text{OP-ADJ} & Operator\text{-}adjsOut[5]
\end{bmatrix} \\
\text{CONT} \begin{bmatrix} \text{NUC} & SemanticsOut[6] \end{bmatrix}
\end{bmatrix}
\end{bmatrix}
)
$$

:–
    add_adj_top(Head[1], SubcatIn[2], SubcatOut[4], SemanticsIn[3],
        SemanticsMid[7], ⟨⟩, Operator-adjsMid[8]),
    process_op_adjs(SemanticsMid[7], SemanticsOut[6], Operator-adjsMid[8], Operator-
adjsOut[5]).

- Top level rule used in the addition of adjuncts: forces all adjuncts to be added to the SUBCAT list after all complements.

    add_adj_top(Head[1], SubcatIn[2], SubcatOut[3], SemanticsIn[4], SemanticsOut[5],
        Operator-adjsIn[6], Operator-adjsOut[8]) :–
        add_adj(Head[1], AdjunctList[7], SemanticsIn[4], SemanticsOut[5],
            Operator-adjsIn[6], Operator-adjsOut[8]),
        append(SubcatIn[2], AdjunctList[7], SubcatOut[3]).

- Top level rule which specifies that pseudo-complements can only be added to the SUB-CAT list of verbs open to pseudo-complementation with a subject and an object complement; further specifies the unification of the *thematic* information added by the pseudo-complement with the verb's internal thematic element. This adds the information into the existing representation of the verb's semantics.

$$\text{add\_adj\_top}(\text{Head}_{\boxed{4}},\ \text{SubcatIn}\langle \text{NP:}\boxed{1}, \text{NP:}\boxed{2}\rangle,$$
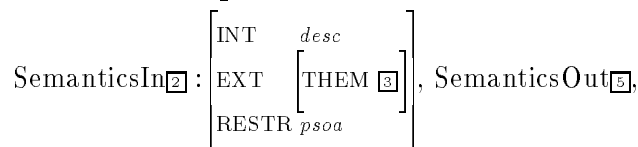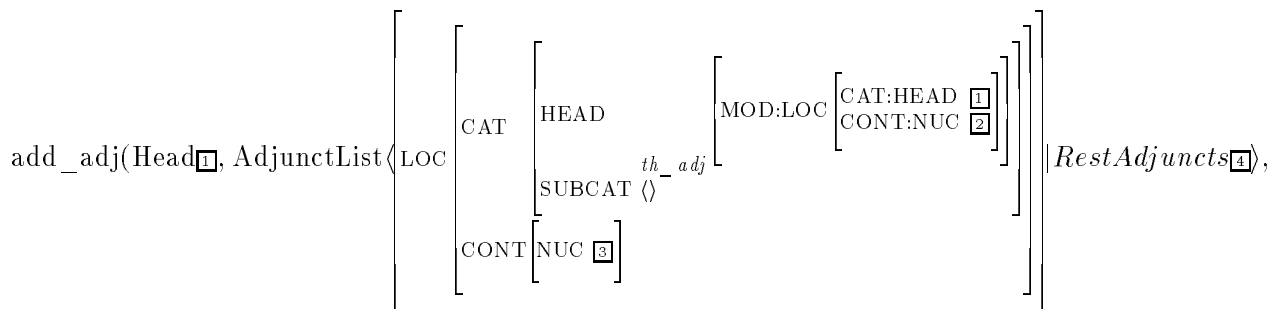
$$\text{SubcatOut}\langle \text{NP:}\boxed{1}, \text{NP:}\boxed{2}, \begin{bmatrix} \text{LOC} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{HEAD} \begin{bmatrix} \text{MOD:LOC} \begin{bmatrix} \text{CAT:HEAD } \boxed{4} : verb\_open\_to\_pc \\ \text{CONT:NUC } \boxed{3} \end{bmatrix} \end{bmatrix} \\ \text{SUBCAT } \langle\rangle \end{bmatrix}^{p\_pc} \\ \text{CONT} \begin{bmatrix} \text{NUC } \boxed{5} \end{bmatrix} \end{bmatrix} \end{bmatrix} \Big| \boxed{6}\rangle,$$

$$\text{SemanticsIn}_{\boxed{3}} : \begin{bmatrix} \text{INT} \begin{bmatrix} \text{ACTION } occurrences \\ \text{THEM } \boxed{5} \end{bmatrix} \\ \text{EXT } ext\text{-}desc \\ \text{RESTR } psoa \end{bmatrix},\ \text{SemanticsOut}_{\boxed{7}},$$

$$\text{Operator-adjsIn}_{\boxed{8}},\ \text{Operator-adjsOut}_{\boxed{9}}) :-$$
$$\text{add\_adj}(\text{Head}_{\boxed{4}},\ \text{AdjunctList}_{\boxed{6}},\ \text{SemanticsIn}_{\boxed{3}},\ \text{SemanticsOut}_{\boxed{7}},$$
$$\text{Operator-adjsIn}_{\boxed{8}},\ \text{Operator-adjsOut}_{\boxed{9}}).$$

- Base case for adding adjuncts – adds no adjunct, and the output semantics is unified with the input semantics. The argument structure for this function is add_adj(Head, Adjuncts, SemanticsIn, SemanticsOut, Operator-adjsIn, Operator-adjsOut).

$$\text{add\_adj}(\_,\ \langle\rangle,\ \text{Semantics}_{\boxed{1}},\ \text{Semantics}_{\boxed{1}},\ \text{Operator-adjs}_{\boxed{2}},\ \text{Operator-adjs}_{\boxed{2}}).$$

- Adds a thematic adjunct; specifies the unification of the *thematic* information added by the adjunct with the situational (external) thematic elements. This adds the information into the existing representation of the situation as a whole.

$$\text{add\_adj}(\text{Head}_{\boxed{1}},\ \text{AdjunctList}\langle \begin{bmatrix} \text{LOC} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{HEAD} \begin{bmatrix} \text{MOD:LOC} \begin{bmatrix} \text{CAT:HEAD } \boxed{1} \\ \text{CONT:NUC } \boxed{2} \end{bmatrix} \end{bmatrix} \\ \text{SUBCAT } \langle\rangle \end{bmatrix}^{th\_adj} \\ \text{CONT} \begin{bmatrix} \text{NUC } \boxed{3} \end{bmatrix} \end{bmatrix} \end{bmatrix} \Big| RestAdjuncts_{\boxed{4}}\rangle,$$

$$\text{SemanticsIn}_{\boxed{2}} : \begin{bmatrix} \text{INT } desc \\ \text{EXT } \begin{bmatrix} \text{THEM } \boxed{3} \end{bmatrix} \\ \text{RESTR } psoa \end{bmatrix},\ \text{SemanticsOut}_{\boxed{5}},$$

$$\text{Operator-adjsIn}_{\boxed{6}},\ \text{Operator-adjsOut}_{\boxed{7}}) :-$$
$$\text{add\_adj}(\text{Head}_{\boxed{1}},\ \text{RestAdjuncts}_{\boxed{4}},\ \text{SemanticsIn}_{\boxed{2}},\ \text{SemanticsOut}_{\boxed{5}},$$
$$\text{Operator-adjsIn}_{\boxed{6}},\ \text{Operator-adjsOut}_{\boxed{7}}).$$

- Adds a restrictive adjunct; specifies that the *sit-desc* object found in the SYNSEM:LOC:CONT:NUC field of the adjunct definition becomes the semantics associated with the current situation.

$$
\text{add\_adj}(\text{Head}_{\boxed{1}}, \text{AdjunctList}\langle \left[\text{LOC} \left[\text{CAT} \left[\text{HEAD} \left[\text{MOD:LOC} \left[\begin{array}{l} \text{CAT:HEAD } \boxed{1} \\ \text{CONT:NUC } \boxed{2} \end{array} \right] \right]_{restr} \right. \right. \right. \\ \left. \text{SUBCAT } \langle\rangle \\ \left. \text{CONT} \left[\text{NUC } \boxed{3} \right] \right] \right] \| RestAdjuncts_{\boxed{4}}\rangle,
$$

SemanticsIn$_{\boxed{2}}$, SemanticsOut$_{\boxed{5}}$, Operator-adjsIn$_{\boxed{6}}$, Operator-adjsOut$_{\boxed{7}}$) :–
add_adj(Head$_{\boxed{1}}$, RestAdjuncts$_{\boxed{4}}$, Semantics-of-Adjunct$_{\boxed{3}}$, SemanticsOut$_{\boxed{5}}$, Operator-adjsIn$_{\boxed{6}}$, Operator-adjsOut$_{\boxed{7}}$).

- Adds an operator adjunct to both the adjuncts list and the operator-adjuncts list. Function *eval_sem_oblique* evaluates the semantic obliqueness of this adjunct with respect to other elements of the operator-adjuncts list and inserts it in the appropriate place ($\boxed{2}$ is the *synsem* value associated with the adjunct, $\boxed{6}$ is the original OP-ADJ list and $\boxed{7}$ is the modified OP-ADJ list). Does not change the semantics associated with the current situation.

$$
\text{add\_adj}(\text{Head}_{\boxed{1}}, \text{AdjunctList}\langle \boxed{2} : \left[\text{LOC:CAT} \left[\begin{array}{l} \text{HEAD} \\ \text{SUBCAT } \langle\rangle \end{array} \right]_{op\_adj} \left[\text{MOD:LOC:CAT:HEAD } \boxed{1} \right] \right] \| RestAdjuncts_{\boxed{3}}\rangle,
$$

SemanticsIn$_{\boxed{4}}$, SemanticsOut$_{\boxed{5}}$, Operator-adjsIn$_{\boxed{6}}$, Operator-ajdsOut$_{\boxed{8}}$) :–
eval_sem_obliq(AddedAdjSynsem$_{\boxed{2}}$, Operator-adjsIn$_{\boxed{6}}$, Operator-adjsNew$_{\boxed{7}}$),
add_adj(Head$_{\boxed{1}}$, RestAdjuncts$_{\boxed{3}}$, SemanticsIn$_{\boxed{4}}$, SemanticsOut$_{\boxed{5}}$, Operator-adjsNew$_{\boxed{7}}$, Operator-adjsOut$_{\boxed{8}}$).

5.7 Dative alternation

Within the framework developed in this paper, dative alternation must be seen as an alternation between two forms of pseudo-complementation. The phenomenon can therefore be captured in terms of lexical rules. The dative form is accounted for straightforwardly by the pseudo-complementation lexical rule introduced in Section 5.6. The double object form must be allowed by another rule, such as the one specified in (83). This rule identifies a pseudo-complement preposition which supplies the semantics associated with the NP inserted into the SUBCAT list. This NP can be seen as the object of the missing preposition. The lexical rule induces a "focus shift", raising the inserted NP in obliqueness to the level of direct object and pushing the original direct object down to the level of indirect object.

(83)   add_adj_top(Head$_{[4]}$, SubcatIn⟨NP:$_{[1]}$, NP:$_{[2]}$⟩, SubcatOut⟨NP:$_{[1]}$, NP:$_{[3]}$, NP:$_{[2]}$|$AdjunctList_{[6]}$⟩,

$$
\text{SemanticsIn}_{[10]} : \begin{bmatrix} \text{INT} & \begin{bmatrix} \text{ACTION } action \\ \text{THEM} & [5] \end{bmatrix} \\ \text{EXT} & \textit{ext-desc} \\ \text{RESTR } psoa \end{bmatrix},
$$

SemanticsOut$_{[7]}$, Operator-adjsIn$_{[8]}$, Operator-adjsOut$_{[9]}$) :−

$$
\begin{bmatrix} \text{LOC} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \text{MOD:LOC} \begin{bmatrix} \text{CAT:HEAD} & [4] : verb\_open\_to\_pc \\ \text{CONT:NUC} & [10] \end{bmatrix} \end{bmatrix} \\ & {}^{p\_pc} \\ \text{SUBCAT } ⟨\text{NP} : [3]⟩ \end{bmatrix} \\ \text{CONT:NUC } {}_{thematic}\begin{bmatrix} [5] \end{bmatrix} \end{bmatrix} \end{bmatrix},
$$

add_adj(Head$_{[4]}$, AdjunctList$_{[6]}$, SemanticsIn$_{[10]}$, SemanticsOut$_{[7]}$,
        Operator-adjsIn$_{[8]}$, Operator-adjsOut$_{[9]}$).

This approach to the dative alternation links the alternate forms through the semantics associated with the dative (pseudo-complement) preposition − the semantics provided in one case by the preposition is in the other case indicated by the obliqueness of one NP relative to the other. Thus the approach makes a generalisation about the relationship between dative PPs and inner double object NPs. Furthermore, the approach ensures that there is only one available interpretation of the double object form − the pseudocomplement interpretation − even if the "missing" preposition can be interpreted as either a pseudo-complement or an adjunct type preposition. It is also in line with Jackendoff's (1990) analysis in which the double object form only allows an interpretation in which the object of the preposition benefits from the object of the verb, but differs from that work in that here the double object form has an interpretation identical to one of the interpretations of the dative form (see Section 3.2.1).

The rule in (83) above is only an example of how the double-object form lexical rule could be defined. In actuality, this rule would likely have to define more complicated modifications of the internal semantic structure expressed by the verb in the alternate form. Several lexical rules of this type may also be necessary, probably involving a more precise definition of the initial internal semantics associated with the verb, to capture different types of semantic alternation between the dative and double object forms.[21] The form of the rules is not critical for the current discussion; the fact that such rules can be defined to account for the dative alternation is important.

The lexical rule approach to the treatment of the semantics of the two forms involved in the dative alternation provides a means of accounting for alternation contrasts previously difficult to explain. Consider the sentences in (84)-(89). (From Jackendoff 1990, who attributes (84)-(85) and (88)-(89) to Jane Grimshaw.)

(84) a.   John fixed the roof for Mary.

      b.   *John fixed Mary the roof.

---

[21] See Verspoor (1994) and Pinker (1989) for a fuller discussion of lexical rules used to capture syntactic alternations with corresponding semantic consequences which depend on a verb's semantics.

(85) a.   John fixed a sandwich for Mary.

  b.   John fixed Mary a sandwich.

(86) a.   Bill removed the garbage for Harold.

  b.   *Bill removed Harold the garbage.

(87) a.   John chose a dress for Mary.

  b.   *John chose Mary a dress.

(88) a.   Sue poured some cement for Dick.

  b.   *Sue poured Dick some cement.

(89) a.   Sue poured some coffee for Dick.

  b.   Sue poured Dick some coffee.

The contrast between (84) and (85) stems from differences in the meaning expressed by the verb *fix*. In (84), *fix* means *repair*, and is apparently not open to pseudo-complementation on this interpretation. The only lexical rule which can be used to interpret (84a) is the thematic adjunction lexical rule, resulting in an interpretation in which the entire fixing event is done for Mary. No interpretation of (84b) is possible because the lexical rule licensing the double object form requires the modified verb to be open to pseudo-complementation. In (85), on the other hand, *fix* is being used to mean *make*, which is open to pseudo-complementation, and therefore the double object form lexical rule can apply to provide an interpretation for (85b). Likewise, the verbs in (86) and (87) are not open to pseudo-complementation and thus the double object forms involving these verbs are not permitted. Only the thematic adjunct interpretation of the PPs is available.

The contrast between (88) and (89) must be a result of consultation of world knowledge in the application of the lexical rules. There is no difference in the senses of *pour* expressed in these sentences. On the pseudo-complementation interpretation of these sentences (that is, when the pseudo-complement lexical rule introduces the *for*-phrase), what is being poured is interpreted as affecting Dick directly. While there are clearly several senses in which coffee can benefit Dick (e.g. because it is liquid and humans need liquid to survive; because it is warm; etc.), there is no sense in which the cement in (88) can affect Dick directly, likely because Dick is not intended to receive the cement. Thus the pseudo-complement interpretation of these sentences is ruled out on the grounds of limitations in the world.

6 Conclusions

The proposals made in this paper concerning the treatment of adjuncts go a long way towards appropriately handling the characteristics of adjuncts:

- ***Consistent semantic contribution:*** There is only one lexical entry required in this approach for each meaning associated with an adjunct, even if the adjunct is involved in different types of adjunction.

- **_Restrictive and operator adjuncts:_** Both of these types of adjuncts are accounted for and treated in a way which reflects precisely the type of modification which must be associated with them; namely that restrictive adjuncts directly modify the situation expressed by the verb and that operator adjuncts take a full situation as an argument. A third type of adjunct, *thematic adjuncts*, has also been identified as a type of adjunct which adds information about a situation as a whole.

- **_Surface order vs. semantic obliqueness:_** The interaction between surface order and semantic obliqueness for operator adjuncts is accounted for by maintaining lists which reflect both of these types of information – surface order in the SUBCAT list and semantic obliqueness in the OP-ADJS list.

- **_Redundancy constraints:_** Redundant PPs are avoided through use of a type system which keeps track of modifying information associated with a sentence. The lexical rules would then simply need to include a subsort check to prevent two modifiers of the same type in a sentence.

- **_Mittelfeld phenomena:_** Complements and adjuncts both appear on the SUBCAT list of a head. There is thus nothing structural which prevents these elements from being interspersed. The linear precedence rules must be responsible for determining their allowed relative order.

The advantages of the approach presented in this paper over the previous approaches from which it is derived can be summarized as the following:

- The redundancy constraint problem is solved in a clear way via the type system.

- The division between external and internal semantics allows various types of modification, including types not handled in the previous approaches (thematic adjuncts and pseudo-complements), to be accommodated within the same framework. In particular, the use of a semantic object of type *thematic* common to external and internal semantics provides for a general treatment of prepositions which can behave both as a thematic adjunct and as a pseudo-complement. This treatment can even account for the ambiguity of interpretation found in sentences involving such prepositions.

- Dative alternation can be easily accounted for by defining variants of the basic pseudo-complementation lexical rule. The approach leaves open the possibility of an explanation of the "openness" of verbs to this alternation.

- The interspersal of operator adjuncts with other types of adjuncts does not lead to interpretation errors.

- There is a more straightforward framework in which to account for the interaction between surface order and semantic precedence. The use of delayed evaluation and linear precedence rules which follow surface order allows the context to drive adjunct interpretation.

It must also be pointed out that the precise inventory of representational elements introduced in this paper is not critical. Only general aspects of the semantic representation are crucial:

the distinction between internal and external semantics and the commonality of the THEMATIC attribute to these components. It is these elements which allow for the general treatment of various adjunct types.

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