Using GB Principles to Describe Danish, English and German in LFG

Gerold Schneider
Universität Zürich
gschneid@ifi.unizh.ch

Abstract

This paper uses examples from Danish, English and German in order to illustrate how to write NL grammars in Lexical-Functional Grammar (LFG). Linguistically based on Government & Binding (GB) theory, it tries to combine well-researched GB analyses with the high versatility, flexibility and implementability of LFG. The grammar excerpt presented focusses on word-order.

1 Introduction

1.1 Lexical-Functional Grammar (LFG)

Since its introduction in the late seventies (Sells 1985: 135), LFG has established itself as a popular framework for the description of formal NL grammars. While it has been described as "essentially Chomskian" (Horrocks 1987: 225), it departs in several ways from the Chomskian theories. While this paper does not aim to be an introduction to LFG, the abovementioned works, i.e. Sells (1985: 135-190) and Horrocks (1987: 225-286) are hereby recommended for reference.

1.2 Government & Binding (GB)

There exist a number of different versions of and extensions to the Chomskian theories which are commonly referred to as GB, although Chomsky himself stresses that "[t]he terminology is misleading" (Chomsky 1995: 29) because GB is only a part of the theory, which would be better described as the Principles & Parameters approach (P&P). Refer to Cowper (1992) for an introduction to a version of the theory which is very close to the one used here. Vikner (1995) is even more relevant for some of the syntactic phenomena discussed here, especially "Verb Second" (V2).

1.3 The Example Languages of Danish, German and English

While these three languages all form part of the germanic group and are therefore related to each other, there are also considerable differences between them on several levels. Morphologically, the German system is highly complex while the Danish one is most simple. Syntactically, Danish and German are Verb Second (V2) languages, while English is not, as we shall see in the following section. Etymologically, English has been subjected to a very strong French influence for centuries, in the aftermath of the battle of Hastings in 1066. This paper is devoted to syntactic issues, however. Because English and German are well-documented and also well-known to many linguists, I only want to recommend Braunmüller (1991) as a very entertaining introduction to Danish and the Scandinavian languages generally.

2 The Syntactic Characteristics of Danish, German and English

At a first glance, the three languages concerned seem to have similar syntactic structures (Vikner 1995: 41):

(1)	*ENGLISH:*	*The children*	*saw*	*the film*
	DANISH:	Børnene	så	filmen
	GERMAN:	Die Kinder	sahen	den Film
	Subject - Verb - Object			

Subordinate clauses or topicalised clauses reveal differences, however (Vikner 1995: 42):

(2)	*ENGLISH:*	*...*	*that*	*the children*	*have*	*seen*	*the film*		
	DANISH:	...	at	børnene	har	set	filmen		
	GERMAN:	...	dass	die Kinder			den Film	gesehen	haben
	Subordinate Clause								

(3)	*ENGLISH:*	*This film*		*the children*	*have*	*seen*
	DANISH:	Denne film	har	børnene		set
	GERMAN:	Diesen Film	haben	die Kinder		gesehen
	Topicalisation					

Let us consider a possible explanation:

2.1 Verb Second (V2)

In German and Danish, but not in English, the finite verb remains in the second position in the topicalised sentence (3). German and Danish show a typical Verb Second (V2) behaviour. The verb defends its position at the second place in the sentence in most syntactic structures. Languages like English are what Rizzi (1990) calls 'residual V2 languages', because they have V2 in questions.

There is one important exception, however, in which the verb has to give up its position of the second element: in subordination. In the subordinate clause (2) at least the German structure is different from the one of the main clause, with the verb appearing in a different position later in the sentence. Inserting an adjective or a negation shows that also the Danish subordinate structure is different from its main one, the verb also appearing later in the sentence:

(4)	*ENGLISH:*	*The children*	*have*	*not*	*seen*	*the film*	
	DANISH:	Børnene	har	ikke	set	filmen	
	GERMAN:	Die Kinder	haben			den Film	nicht gesehen
	Negated Main Clause						

(5)	*ENGLISH:*	*that*	*the children*		*have*	*not*	*seen*	*the film*	
	DANISH:	at	børnene	ikke	har		set	filmen	
	GERMAN:	dass	die Kinder					den Film	nicht gesehen haben
	Negated Subordinate Clause								

Conditional clauses show that complementisers and verbs are in mutual distribution, which in turn suggests that they contend for the same place in the syntactic structure (Vikner 1995:43):

(6)	*ENGLISH:*	*If*	*I*	*had*	*had*	*more*	*time,*	*...*
	DANISH:	Hvis	jeg	havde	haft	mere	tid,	...
	GERMAN:	Wenn	ich			mehr	Zeit	gehabt hätte, ...

Conditional Clause with Subordinator

(7)	*ENGLISH:*	*Had* $_i$	*I*	t_i	*had*	*more*	*time,*	*...*
	DANISH:	Havde $_i$	jeg	t_i	haft	mere	tid,	...
	GERMAN:	Hätte $_i$	ich			mehr	Zeit	gehabt t_i, ...

Conditional Clause without Subordinator. t_i is the trace of the moved verb

(8)	*ENGLISH:*	**If had* $_i$	*I*	t_i	*had*	*more*	*time,*	*...*
	DANISH:	*Hvis havde $_i$	jeg	t_i	haft	mere	tid,	...
	GERMAN:	*Wenn hätte $_i$	ich			mehr	Zeit	gehabt t_i, ...

Complementiser and Verb at the Same Place. t_i is the trace of the moved verb

On these grounds, it is justifiable to "follow most of the generative literature on V2 ... in assuming that the finite verb (in sentences with no complementizer) occurs in the position C^0, in which the complementiser would have otherwise occurred." (Vikner 1995: 42). We therefore want to assume that whenever a complementiser is absent in a V2 language, the conjugated verb will take its place.

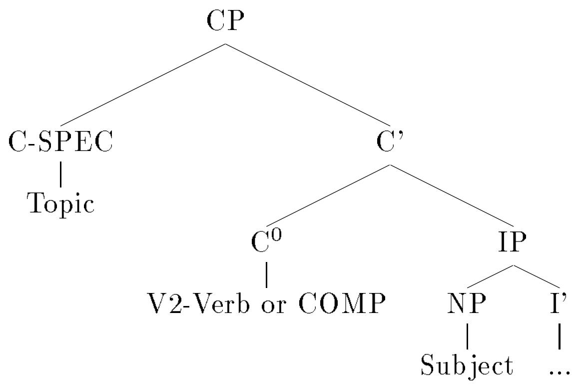
In V2 languages, the first position in the sentence is often taken by the subject, but the topicalisation in (3) also allows an object; in fact many different constituents can move to it (Vikner 1995: 39):

(9)	*ENGLISH:*	**Maybe*	*has*	*Peter*	*read*	*this*	*book*	
	DANISH:	Måske	har	Peter	læst	denne	bog	
	GERMAN:	Vielleicht	hat	Peter		dieses	Buch	gelesen

Topicalisation

According to these data, we can postulate the following general clause structure:

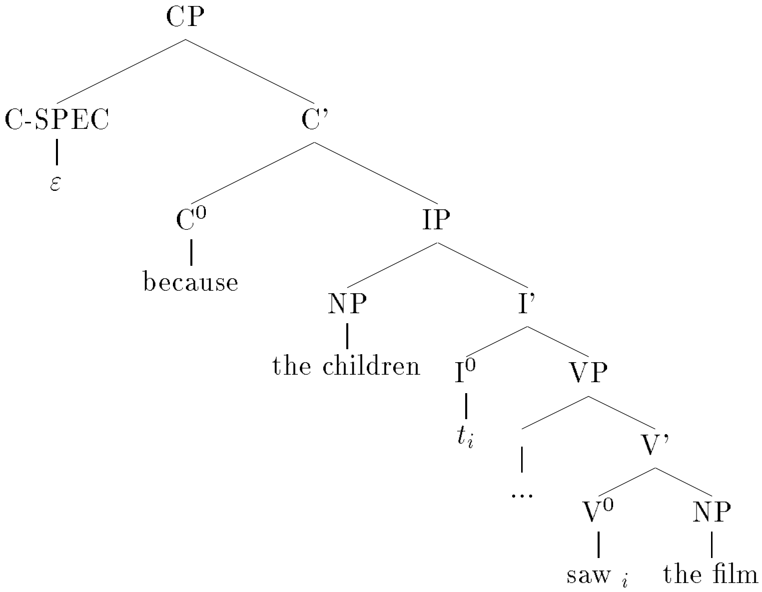
1.

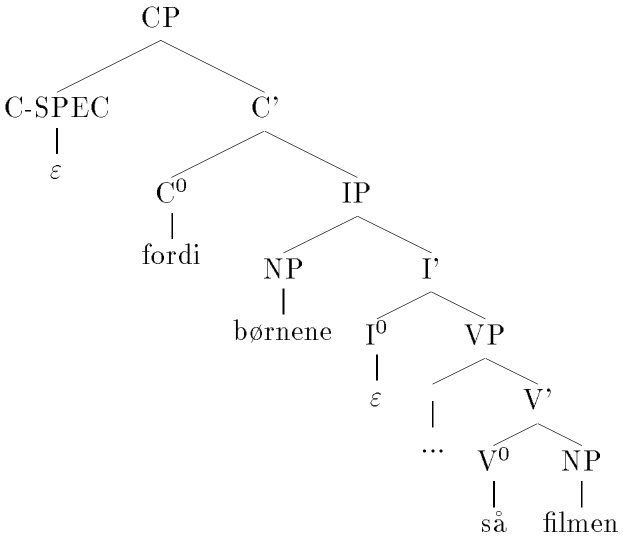


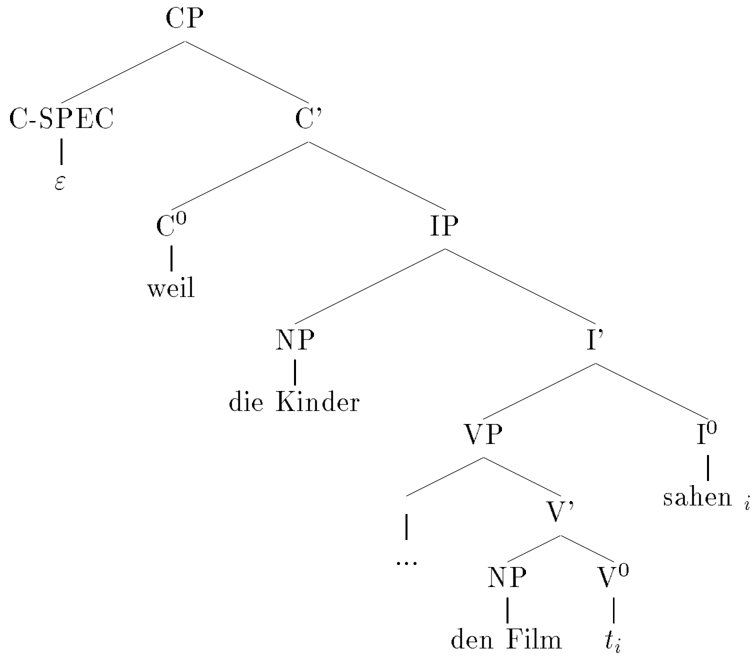
2.2 Constituent Order

One more difference between the three languages is that German has reversed constituent order under the I'-node and under the V'-node. This reversed order derives from the

German inherent SOV (Subject-Object-Verb) character, in oppostion to the English and Danish SVO (Subject-Verb-Object) order. Let us consider the subordinate clause "because the children saw the film" in the three languages described:

1. 

2. 

3. 

2.3 V^0-to-I^0 Movement

The above trees for Danish and English look the same. Again, this is not entirely true, as the insertion of a negation or an adjective shows that Danish knows no V^0-to-I^0 movement (cf. Vikner:1995, 40-41)

		C^0	I-SPEC	I^0	AdvP	V^0	NP
ENGLISH:	...	because	the children	have	not	seen	the film
DANISH:	...	fordi	børnene		ikke	har set	filmen

3 An LFG Implementation of the GB Framework

Let us now turn to the description of these GB findings within LFG. To sum up the last section, our Danish, German and English grammar should use similar rules for these languages, differences only arising from the lexicon and in order to pay respect to the differences described:

(1) German and Danish, but not English are V2 languages.
(2) German has reverted constituent order in two cases.
(3) Danish has no V^0-to-I^0 movement, unlike English and German.

3.1 Using GB in LFG

There are many ways how to write an LFG grammar. The advantage of using a GB background is that it is well-researched. Using a GB approach within LFG is not unusual. Sells (1985) employs at least a reduced version of the X-bar theory. Berman and Frank (1996) present a bigger grammar for German and French which is based on a GB approach with similarities to the one of this paper. Note that for languages which are more problematic to describe by GB, it is more sensible to abandon GB analysis and to use the LFG versatility directly.

The fact that LFG assigns a distinguished status to notions like "subject" and "object" by taking them as primitives of the theory has the comfortable side effect that NP tracing is automatically taken care of. If e.g. an object occurs fronted in C-SPEC position, later rules which would allow an object in its original position under V' have to fail because the object feature is already saturated. For the same reason, sentences without subjects but with a verb subcategorising for a subject have to fail. The same holds for any other argument.

Verb traces, on the other hand, have to be managed by the grammar. Information on which clause type has to be used needs to be assigned by using functional annotation. By checking on clause type in following PS rules we make sure that all inappropriate clause types will fail.

ROOT	$\rightarrow$	CP
		$\uparrow=\downarrow$
		($\uparrow$C-HEAD FINIT) = +

This is the top ramification of every such LFG grammar. It assigns C-HEAD FINIT=+ to a clause starting with CP, i.e. a sentence, thus making sure that every sentence is finite. Vocabulary entries for finite verbs, and complementisers which introduce finite clauses also carry FINIT=+ in order to allow or fail unification, as in the following English example of 'that', a subordinating conjunction subcategorising for a functional complement which has to be finite. Note that C-HEAD FINIT=+ is not assigned to the main clause, but to the functional complement subcategorised for by 'that', i.e. the subordinate clause.

that	COMP	($\uparrow$PRED) = 'that$\langle$($\uparrow$FCOMP)$\rangle$'
		($\uparrow$ FCOMP C-HEAD WH) = -
		($\uparrow$ FCOMP C-HEAD FINIT) = +

I have borrowed the terms FCOMP (Functional Complement) and VCOMP (Verbal Complement) from Berman and Frank (1996). They both correspond to COMP (if the subordinate subject is explicit) or to XCOMP (if the subordinate subject is bound by verb control) in Sells (1985: 155). Refer to section 3.5 for an example of VCOMP.

3.2 Complementizer Phrase (CP)

CP	$\rightarrow$	C-SPEC	C'
		$\uparrow=\downarrow$	$\uparrow=\downarrow$

This is trivial. Let us consider the decomposition of C-SPEC, first for Danish and German:

C-SPEC	$\rightarrow$	NP
		($\uparrow$ Subj) = $\downarrow$
		($\uparrow$ C-HEAD CTYPE) = V2
		($\uparrow$ C-HEAD WH) $\neq_c$ +

Here we have to make the first language-specific decisions. While Danish and German allow V2 assertive clauses, English does not. The constraint equation ($\uparrow$ C-HEAD WH) $\neq_c$ + is employed to make sure that we are not dealing with a question. Constraint equation (Sells 1985: 159) is used here because the default value of WH is -.

There can be an argument about how to term the sentence type in which the verb does not move to C^0, i.e. the clause type shown in section 2.2. In German, they are Verb

Last (VL), but this term does not express the Danish and English situation, because the verb is by no means at the last position. The GB analyses of 2.2 show, however, that except for the reversion of the constituent order, the same structure and thus the same clause type applies for all languages. I suggest using the term Verb Residual (VR) for this clause type, in analogy to Rizzi's (1990) residual V2 languages, and because the verb resides in its original position of V^0 or I^0.

The German equivalent to the 'that' lexical entry at the end of section 3.1 includes the annotation ($\uparrow$ FCOMP C-HEAD CTYPE) = VR in order to ensure that subordinated clauses introduced by a complementiser are VR.

Let us turn back to the above C-SPEC rewrite rule which expands to a topicalised subject. The rules for topicalised objects or other topicalised elements are analogous. While English subjects are usually not topicalised, objects may well be so, as the following English rule shows. Note that it also makes sure that topicalised English clauses must be VR.

C-SPEC $\rightarrow$ NP
($\uparrow$ Obj) = $\downarrow$
($\uparrow$ C-HEAD CTYPE) = VR
($\uparrow$ C-HEAD WH) $\neq_c$ +

More rules can appear at this level, such as a rule for a VR clause introduced by a WH element; in fact any other clause type may be introduced here as long as we make sure to keep track of it at the appropriate later PS rules further down the tree, like in this example, which makes sure that V only attaches to the C_0 position when in a V2 clause:

C_0 $\rightarrow$ V
$\uparrow$=$\downarrow$
($\uparrow$ C-HEAD CTYPE) = V2
($\uparrow$ C-HEAD FINIT) = +
($\uparrow$ C-HEAD WH) $\neq_c$ +

3.3 Inflectional Phrase (IP)

The rewrite rule I" $\rightarrow$ I' is trivial, with I' possibly expanding into a subject NP. The decomposition of I' is more interesting. It expands to I^0 and V", but in reverse order in German. Danish always stipulates an empty I^0, while in English and German, it has to remain empty (GB trace) in case of a V2 clause (in English, questions are V2).

In the Danish grammar, we find:

I_0 $\rightarrow$ ε

In the English and German grammar, we find:

I_0 $\rightarrow$ ε
($\uparrow$ C-HEAD CTYPE) = V2

Nonfinite clauses obviously require empty I^0, but German VL clauses do have a verb. In all grammars, we find:

I_0 $\rightarrow$ ε
($\uparrow$ C-HEAD FINIT) = -

In the German and English grammar, we also find:

$$I_0 \rightarrow \begin{array}{l} \text{V} \\ (\uparrow \text{C-HEAD CTYPE}) = \text{VR} \\ (\uparrow \text{C-HEAD FINIT}) = + \end{array}$$

3.4 Verb Phrase (VP)

Treatment of the VP runs along similar lines. German has reversed constituent order again. Note that because of the fact that Danish has an empty I^0, it needs a recursive mechanism to accommodate auxiliaries. Such a recursion could lead to an endless loop, i.e. allow an endless sequence of verbs. But LFG functional annotations restrict this recursion. Let us see an example in the following section:

3.5 Verb Subcategorisation

Most of the subcategorisations come from the lexicon. LFG is strongly lexicon-driven. LFG verbs do not only subcategorise for subjects and objects, but also for verb complements, clause complements and so on. The below lexical entry shows the Danish auxiliary 'to have' in need of a verb complement:

$$\text{har} \quad \text{V} \quad \begin{array}{l} (\uparrow\text{PRED}) = \text{'PERFECTIVE}\langle(\uparrow\text{VCOMP})\rangle(\uparrow\text{SUBJ})\text{'} \\ (\uparrow \text{SUBJ}) = (\uparrow \text{VCOMP SUBJ}) \\ (\uparrow \text{C-HEAD FINIT}) = + \\ (\uparrow \text{VCOMP VTYPE}) = \text{PP} \end{array}$$

The equation (↑ SUBJ) = (↑ VCOMP SUBJ) ensures that the subject of the main clause and the verb complement clause are the same, much like in functional control (Sells 1985: 165n). It is this equation which allows the verb recursion desribed above (in the last section), because it saturates the subject subcategorised for by the auxiliary verb. Note that this subject is athematic (Sells 1985: 165).

Let us consider two English main verbs asking for clause complements, the latter using functional control:

$$\text{wonder} \quad \text{V} \quad \begin{array}{l} (\uparrow\text{PRED}) = \text{'wonder}\langle(\uparrow\text{SUBJ})(\uparrow\text{FCOMP})\rangle\text{'} \\ (\uparrow \text{FCOMP C-HEAD WH}) = + \\ (\uparrow \text{FCOMP C-HEAD FINIT}) = + \end{array}$$

$$\text{cause} \quad \text{V} \quad \begin{array}{l} (\uparrow\text{PRED}) = \text{'cause}\langle(\uparrow\text{SUBJ})(\uparrow\text{FCOMP})\rangle\text{'} \\ (\uparrow \text{FCOMP C-HEAD WH}) = \text{-} \\ (\uparrow \text{FCOMP C-HEAD FINIT}) = \text{-} \\ (\uparrow \text{OBJ}) = (\uparrow \text{FCOMP SUBJ}) \end{array}$$

4 Conclusion

The rules presented here are only small excerpts of a bigger grammar, which is still under construction. I hope to have shown that GB and LFG can be easily combined. Classical GB rule expansion from CP to IP to VP has been described in LFG. Combining LFG and GB as sketched out here is a good way for people well acquainted with GB to write grammars in LFG, and the other way round. While GB grammars are well-researched, LFG grammars are highly implementable - a combination of them allows to use the best of both worlds.

5 Bibliography

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