

**THE TREATMENT OF TENSE**

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# 1 Introduction

This workshop sought to discuss issues with respect to the treatment of tense which have arisen in recent years. By way of an introduction to the workshop, I first laid out the classic approach to the representation of temporal and aspectual information within LFG and then moved on to briefly present some of the more recent developments. In particular, recent work on nominal tense with clausal scope and nonconfigurational tense taken together with the well known problems surrounding the determination of compositional and relational tense, points to the need of a careful reconsideration of the issues involved. My introductory remarks are reproduced in the following sections.

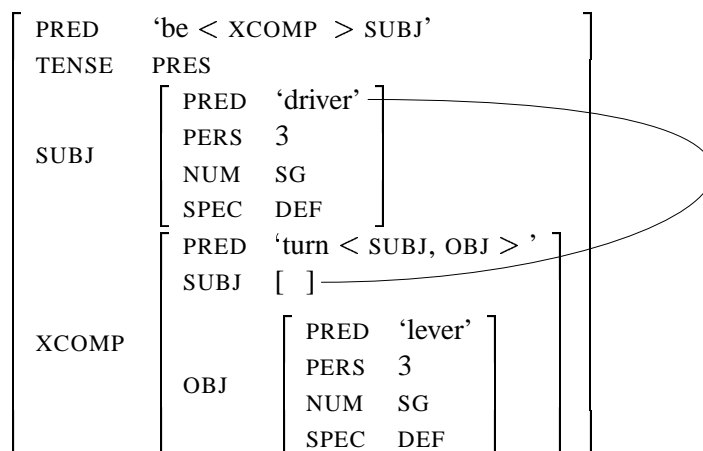
Before delving into the linguistics of tense, however, I would like to thank all of the participants of the workshop for being extremely cooperative and tailoring their contributions exactly as specified by the theme of the workshop. I would also like to thank Henriette de Swart for providing advice and support when it was much needed.

## 2 The Classic Approach

The classic approach to tense within LFG as practiced in Bresnan 1982, for example, includes the postulation of a TENSE feature at f-structure. The range of its values have never been precisely defined, but they are assumed to include at least PRES(ent) and PAST. As far as I can tell, there is no real consideration of the possible representation of aspectual information such as progressive or perfect. For English, Falk 1984 does encode the morphological form of the participle in terms of a PART feature whose values are PROG or PERF.

The encoding of the morphological form of the participle reflects the existence of periphrastic auxiliary constructions in English. In order to ensure that only the right combination of auxiliary and participle is analyzed or generated, information about the form of the participle must be available at some level of representation. As is well known, auxiliaries in English (and German) select the form of their dependent in a cascading relationship. This kind of binary dependence would seem to be at the root of the cross-theoretic analysis of auxiliaries as raising verbs. As illustrated in (1), auxiliaries subcategorize for a non-thematic subject and an XCOMP in the classic LFG approaches.

- (1) a. The driver is turning the lever.  
 b.



### 3 Revision of the Classic Approach

Two undesirable side effects of the classic approach are that although auxiliaries are generally grouped with functional elements, the raising analysis treats them as semantically active predicational elements. That is, auxiliaries are treated on a par with modals and other raising verbs without necessarily sharing all of the properties associated with these other classes of verbs. More recent approaches, such as Bresnan 2001 have reconsidered this assumption and taken a different stance. In keeping with their functional status, auxiliaries are situated in functional categories such as I. Furthermore, auxiliaries are not assumed to have a subcategorization frame, but simply contribute features such as TENSE at the level of f-structure. A sample f-structure is shown in (2).

(2)

- a. The driver will turn the lever.
- b.

PRED	‘turn < SUBJ, OBJ >’								
TENSE	FUT								
SUBJ	<table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">‘driver’</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">CASE</td> <td style="padding: 2px 5px;">NOM</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">NUM</td> <td style="padding: 2px 5px;">SG</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">SPEC</td> <td style="padding: 2px 5px;">DEF</td> </tr> </table>	PRED	‘driver’	CASE	NOM	NUM	SG	SPEC	DEF
PRED	‘driver’								
CASE	NOM								
NUM	SG								
SPEC	DEF								
OBJ	<table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">‘lever’</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">CASE</td> <td style="padding: 2px 5px;">ACC</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">NUM</td> <td style="padding: 2px 5px;">SG</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">SPEC</td> <td style="padding: 2px 5px;">DEF</td> </tr> </table>	PRED	‘lever’	CASE	ACC	NUM	SG	SPEC	DEF
PRED	‘lever’								
CASE	ACC								
NUM	SG								
SPEC	DEF								

With respect to crosslinguistic analysis, the analysis represented by (2) has considerable advantages, as it abstracts away from the surface form in a manner that is consistent with the general analytical endeavour of LFG (see Butt et al. 1996 on the advantages for machine translation applications). For example, it is now possible to abstract away from the difference between periphrastic and morphologically encoded tense.

This revision of the classical approach thus clearly represents a step in the right direction. However, there is still no provision made for the representation of aspectual information on a par with temporal information.

Another problem which remains to be solved is the issue of local dependencies between auxiliaries and participles in periphrastic constructions. Based on a suggestion by Ron Kaplan, Butt et al. 1996 propose to use another level of representation at which such local well-formedness conditions can be stated. This level was dubbed m-structure because it was taken to encode those features which represented local morphological well-formedness conditions with no useful functional or semantic role.<sup>1</sup> The m-structure which ensures the correct local dependencies for the example in (2) is shown in (3).

(3)

m-structure	<table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">AUX</td> <td style="padding: 2px 5px;">+</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">FIN</td> <td style="padding: 2px 5px;">+</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">DEP</td> <td style="padding: 2px 5px;"> <table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">FIN</td> <td style="padding: 2px 5px;">-</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">VFORM</td> <td style="padding: 2px 5px;">BASE</td> </tr> </table> </td> </tr> </table>	AUX	+	FIN	+	DEP	<table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">FIN</td> <td style="padding: 2px 5px;">-</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">VFORM</td> <td style="padding: 2px 5px;">BASE</td> </tr> </table>	FIN	-	VFORM	BASE
AUX	+										
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FIN	-										
VFORM	BASE										

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<sup>1</sup>For example, strong/weak adjective agreement in German has no conceivable functional or semantic use. The agreement system between determiners, adjectives and nouns in German is so arcane as to be incomprehensible (and indeed represents a major problem for German language learners). However, the checking of agreement is needed in order to ensure well-formedness. As such, these agreement features are a good candidate for m-structure.

With the problem of local dependencies solved and the contribution of the auxiliaries whittled down to the contribution of a temporal feature, another possibility for the treatment of periphrastic constructions emerges. For examples like *The driver will have turned the lever.*, the *will* taken together with the *have* could be encoded as the composite tense FUTPERF.

The implementation of this approach is described in Butt et al. 1996. It has the advantage that a higher level of analysis with respect to tense is done at the level of f-structure since the value of tense is calculated based on all of the clausal information available. However, the calculation of composite tenses is hard work in that the lexical entries for items like *will* must encode a large number of disjunctions, as shown in (4) for the German auxiliary *wird*. Note that the disjunctions governing the passive have been left out, (4) shows only part of the entry.

(4) wird	AUX	(↑SUBJ CASE) = NOM	subject agreement
		(↑SUBJ NUM) = SG	
		(μ M* AUX) = +	this is an auxiliary
		{ (μ M* DEP VFORM) = c BASE	Option 1: if bare infinitive
		(μ M* DEP DEP VFORM) ≠ PERFP	no perf. participle
		(↑PASSIVE) ≠ +	and no passive
		“simple future: wird drehen	
		(↑TENSE) = FUT	then simple future
			Option 2
		(μ M* DEP VFORM) = c BASE	if bare infinitive
		(μ M* DEP DEP VFORM) = c PERFP	and a perf. participle
		(↑PASSIVE) ≠ +	and no passive
		“future perfect: wird gedreht haben”	
		(↑TENSE) = FUTPERF }	then future perfect

The computation of these disjunctions turns out to be fairly costly. In addition, it is also not clear whether the calculation of composite tenses always arrives at the most desirable solution. Within the ParGram project (Butt, King, Niño, Segond 1999), this approach was adopted at first, but then abandoned as a consideration of a large amount of data within the large-scale grammar development project forced a realization that the analyses were often either inconsistent or impossible to compute correctly based on the clausal information available at f-structure. (see section 4).

The current solution within the ParGram project is to simply register the morphosyntactic information available in terms of non-composite features such as PERF or FUT, as shown in (5).

- (5) a. The driver will have turned the lever.  
b.

[	PRED	‘turn < SUBJ, OBJ >’	]
SUBJ	[	PRED ‘driver’	]
		CASE NOM	
		NUM SG	
		SPEC DEF	
OBJ	[	PRED ‘lever’	]
		CASE ACC	
		NUM SG	
		SPEC DEF	
TNS-ASP	[	TENSE FUT	]
		ASP PERF	

## 4 Further Problematic Data

Some of the problems encountered as part of the ParGram effort were well-known problems such as the interpretation of relative tense. In (6), for example, morphological past tense must actually be interpreted semantically as future due to the fact that the embedded (or relative clause) must be interpreted *relative* to the matrix clause (the examples are taken from Crouch 1993).

- (6) a. If I smile when I get out, then the interview **went** well.  
 b. By 1998, everybody will have at least one friend who **died** from AIDS.

The calculation of this type of relative tense is in principle possible at the level of f-structure, however, given the fact that the computational effort is significant, the question remains whether the strategy of trying to get the tense value exactly right at the level of f-structure is a feasible one.

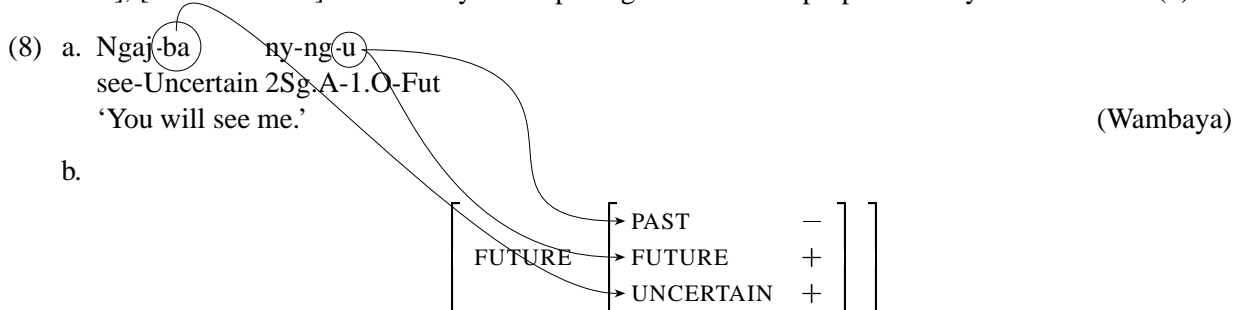
Furthermore, the well-known possibility of polysemy with respect to phenomena such as the English perfect would seem to provide an insurmountable challenge for a complete analysis of tense and aspect at the level of f-structure. Some examples (based on Kiparsky 2001) to illustrate this problem are shown in (7). The possible semantic readings of the morphosyntactic perfect are given in bold face at the beginning of the sentence.

- (7) a. **Existential:** Fred has visited Paris several times.  
 b. **Universal:** I have known him since 1960.  
 c. **Resultative:** The police have probably caught the subject by now.  
 d. **Recent Past:** Musharraf has been sworn in as president. (hot news reading)

Again, the ParGram solution of simply registering the morphosyntactic information as ASP PERF would seem to be the most pragmatic idea. Under this approach, the relevant morphosyntactic information is simply registered at f-structure and then passed on to semantics for further interpretation.

However, for the following questions arise: If the level of f-structure can only effectively be used for a simple registration of morphosyntactic information, then why implicate f-structure at all? Why not register the local morphosyntactic information at m-structure and have semantics be able to access that information?

A further argument for this view would seem to come from Nordlinger and Bresnan's 1996 study of Wambaya in which future tense must be seen as a composite out of the features FUTURE and UNCERTAIN. The morphology determining the composite tense information is distributed all over the clause, as shown in (8). Nordlinger and Bresnan propose to use three features for a decompositional analysis of tense: [ $\pm$ PAST], [ $\pm$ FUTURE], [ $\pm$ UNCERTAIN]. A Wambaya example together with the proposed analysis is shown in (8).



Again, the calculation of the tense feature FUTURE involves the careful piecing together of information from various parts of the clause: a process whose complexity should not be underestimated. The question of whether f-structure should simply be left out of the equation thus rears its head.

## 5 Workshop Contributions

The problems and considerations summarized above were taken as a provocative starting point for the discussion engendered by the workshop. None of the workshop participants agreed with the conclusion that f-structure has no real role to play with respect to the determination of tense. However, the discussion engendered by the workshop produced a more refined idea of the role of f-structure and the type of information that usefully could be represented at that level.

The workshop began with a contribution by Louisa Sadler and Rachel Nordlinger, who continued their investigations into the expression of nominal tense by presenting data from languages in which nominal tense is used to locate the nominal temporally independent of the clausal specification. While they have worked out an account of nominal tense with nominal scope within LFG (Nordlinger and Sadler 2000), the phenomena of nominal tense with nominal scope remains to be tackled within a formal approach. Their contribution to this workshop can thus be viewed as presenting new and potentially problematic data that any formal theory of grammar must take on eventually (cf. Nordlinger and Sadler's 2000 discussion with respect to Bender and Sag's 2000 HPSG analysis).

Christoph Schwarze's contribution considered the nature of features at f-structure and concluded on the basis of Romance data that the traditional TENSE feature must indeed still be given a place at f-structure.

Sheila Glasbey took on the same issue from a semanticist's point of view. Under the assumption that f-structure is the primary input for semantic structure, Glasbey also concluded that the representation of temporal and aspectual information makes sense at the level of f-structure. However, Glasbey provides a much more detailed theory in terms of the crosslinguistically relevant features that should be encoded at f-structure. Glasbey also formulated proposals for the interaction of lexically encoded underspecified information with clausal information. This lexically underspecified information is specified as part of the clausal analysis. The features encoded at f-structure are based on insights from the semantic literature and thus provide just the right information for a temporal and aspectual analysis of continuous discourse.

## References

- Bender, Emily M., and Ivan A. Sag. 2000. Incorporating Contracted Auxiliaries in English. In *Grammatical Interfaces in HPSG*, ed. Ronnie Cann, Claire Grover, and Philip Miller. 17–32. Stanford, California: CSLI Publications.
- Bresnan, Joan (ed.). 1982. *The Mental Representation of Grammatical Relations*. Cambridge, Massachusetts: MIT Press.
- Bresnan, Joan. 2001. *Lexical-Functional Syntax*. Oxford: Blackwell.
- Butt, Miriam, Tracy Holloway King, María-Eugenia Niño, and Frédérique Segond. 1999. *A Grammar Writer's Cookbook*. Stanford, California: CSLI Publications.
- Butt, Miriam, María-Eugenia Niño, and Frédérique Segond. 1996. Multilingual Processing of Auxiliaries in LFG. In *Natural Language Processing and Speech Technology: Results of the 3rd KONVENS Conference*, ed. D. Gibbon. 111–122. Berlin: Mouton De Gruyter. Universität Bielefeld, 7 - 9 October 1996.
- Crouch, Richard. 1993. Tense in Simple Conditionals. In *Proceedings of the 9th Amsterdam Colloquium*.
- Falk, Yehuda N. 1984. The English auxiliary system: A Lexical-Functional analysis. *Language* 60(3):483–509.

- Kiparsky, Paul. 2001. Event Structure and the Perfect. Unpublished Ms., Stanford University.
- Nordlinger, Rachel, and Joan Bresnan. 1996. Non-configurational tense in Wambaya. In *On-line Proceedings of the First LFG Conference, Rank Xerox, Grenoble, August 26–28, 1996*, ed. Miriam Butt and Tracy Holloway King.
- Nordlinger, Rachel, and Louisa Sadler. 2000. Tense as a Nominal Category. In *On-Line Proceedings of the LFG00 Conference*, ed. Miriam Butt and Tracy Holloway King. 197–214. Stanford, California: CSLI Publications. University of California, Berkeley.