Multiple Exponence and Underspecification of Temporal Operators in the Afrikaans Verbal Complex

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1 Introduction

(1) Jan wou die boek gekoop het.
Jan wanted.IMP the book bought.PART AUX

(2) a. Jan wanted to have bought the book.
PAST(Jan wants ^PAST(Jan buys the book))
b. Jan wants to have bought the book.
Jan wants ^PAST(Jan buys the book)
c. Jan wanted to buy the book.
PAST(Jan wants ^(Jan buys the book))

1.1 Goals

- Discussion of the interpretation of past tense forms in Afrikaans ...
- ... to give motivation for underspecification and multiple exponence of temporal operators.
- Caveats:
  - The data is taken from the literature or the internet. So far, systematic work with native speakers is still missing.
  - I only consider "simple" clauses. Sequence-of-tense in embedded clauses is ignored.
  - I am mainly interested in the mechanisms needed to build up logical representations, not in the concrete details of these representations. In this talk, I will assume semantic representations along the lines of Stechow (2002).

1.2 Structure

1. Introduction
2. Afrikaans verbal morphology
3. The interpretation of tense in simple clauses
4. Temporal interpretation inside the verbal complex
5. The syntax-semantics interface
6. Lexical Resource Semantics (LRS)
7. Analysis
8. Summary

2 Afrikaans Verbal Morphology

2.1 *wees* (*be*)

(3) Forms:

wees:	infinitive
is:	finite *presens*
was:	finite *imperfek*
gewees:	past participle

The verb *hê* (*have*) also has four forms in some registers (*hê, het, had, gehad*), but *had* is becoming less and less frequent.

(4) Finite tense forms:

a. Publisiteit **is** belangrijk. (*presens*)
publicity is.PRES important

b. Publisiteit **was** toe al belangrijk. (*imperfek*)
publicity was.IMP then already important

c. Publisiteit het/ is/ was toe al belangrijk **gewees**. (*perfek*)
publicity AUX/ is/ was then already important been.PART
'Publicity was already important back then.'

(5) Infinite forms:

a. Publisiteit kan belangrijk **wees**. (infinitival *presens*)
publicity can.PRES important be.INF

b. En inflasie ... sou sekerlik laer kon **gewees** het, as ... (infinitival *perfek*)
and inflation would.IMP surely lower could.IMP been.PART AUX if
'and inflation could certainly have been lower if ...'

2.2 *om te skryf* (*write*)

(6) Forms:

skryf:	base form
geskryf:	past participle

(7) Finite tense forms:

a. Jan **skryf** 'n boek oor sy pa. (*presens*)
Jan writes.PRES a book about his father

b. Jan het 'n boek oor sy pa **geskryf**. (*perfek*)
Jan AUX a book about his father written.PART

(8) Infinite forms:

a. Jan wil 'n boek oor sy pa **skryf**. (infinitival *presens*)
Jan wants.PRES a book about his father write

b. En deur dit te **gedoen** het, maak hy dit vir ieder en elk van sy kinders moontlik
and by this to done.PART AUX makes he it for each and every of his children possible
om te volhard (infinitival *perfek*)
to continue

2.3 *om te wil* (*want*)

(9) Forms:

wil:	base form
wou:	*imperfek*form

This group also contains the verbs *kan/kon* (*can*), *moet/moes* (*must*), *sal/sou* (*will*) (auxiliary verb to form the future tense), *mag/mog* (*may*).

(10) Finite tense forms:

a. Jan **wil** 'n boek oor sy pa skryf. (*presens*)
Jan wants.PRES a book about his father write

b. Jan **wou** 'n boek oor sy pa skryf. (*imperfek*)
Jan wanted.IMP a book about his father write

(11) Infinite forms:

a. Jan sal a boek oor sy pa **wil** skryf.
Jan will.PRES a book about his father want write
(infinitival *presens*)
'Jan will want to write a book about his father.'

b. Ek het niks oorgehad om te **kon** deel nie
I AUX nothing left-over.PART for to could.IMP share NEG (infinitival *perfek*)
'I didn't have anything left over to be able to share.'

2.4 *het* (*AUX*)

The auxiliary verb *het* can be used in finite and infinitival contexts.

(12) a. Finite form: Jan **het** 'n boek oor sy pa geskryf.
Jan AUX a book about his father written.PART

b. Infinite form: En deur dit te gedoen **het**, ...
and by this to done.PART AUX

Auxiliary *het* lacks a participial form, however. Thus a hypothetical "pluperfect tense" realized morphologically as a "double perfect" such as in Southern German dialects or in Yiddish (see (13-a)) cannot be formed in Afrikaans.

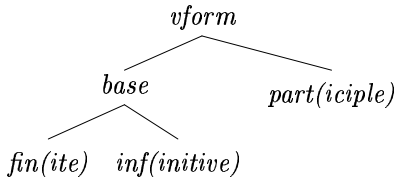
(13) a. Yiddish: ikh hob aykh gehat gevarnt ir zolt nit geyn.
I have you.PL had.PART warned.PART you.PL ought not go.INF
'I had warned you (formal) not to go.' (Katz, 1987, p.ÿ,138)

b. Afrikaans: ek het u gewaarsku *het/ *gehad
I AUX you (formal) warned.PART AUX/ have.PART

2.5 Morphological Classification

With the exception of *wees* (*be*) and *hê* (*have*) Afrikaans makes no morphological difference between finite and infinitival forms.

(14) a. Hierarchy of verbal forms:



b. Verbal forms:

English	verb	verbal form	tense
call	*bel*	*base*	*present*
	gebel	*part*	*(present)*
have	*hê*	*inf*	*present*
	het	*fin*	*present*
	gehad	*part*	*(present)*
AUX	*het*	*base*	*perfect*

English	verb	verbal form	tense
be	*wees*	*inf*	*present*
	is	*fin*	*present*
	was	*fin*	*imperfect*
	gewees	*part*	*(present)*
want	*wil*	*vform*	*present*
	wou	*vform*	*imperfect*

3 The Interpretation of Tense in Simple Clauses

3.1 *Presens*

skryf-Type Verbs

(15) a. Hy het dadelik huis toe gestap.
he AUX really house towards stepped.PART 'He really stepped towards his house.'

b. Toe stap hy dadelik huis toe.
Then goes he really house towards 'Then, he really stepped towards his house.'

c. Verlede week stap hy huis toe, en daar sien hy sy buurman voor die hekkie.
last week steps.PRES he house towards and there sees.PRES he his neighbor in front of the hedge
'Last week, he stepped towards his house and there he saw his neighbor in front of the hedge.'

(16) Logical representation:

a. Jan bel.
Jan calls.PRES 'Jan calls.'

b. $\mathsf{call}'(j)$

c. $\exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e, j))$

s^*	speech time
$\tau(e)$	time of the event e
$\odot$	temporal overlap

wees

(17) a. Hy was dadelik tuis.
he was.IMP really home

b. Toe was/ is hy dadelik tuis.
then was.IMP/ is.PRES he really home

c. Verlede week was/ is hy dadelik tuis en daar kom sy maat op besoek.
last week was.IMP/ is.PRES he really home and his friend comes to see him.

(18) a. Jan is tuis.
Jan is.PRES at home 'Jan is at home.'

b. $\mathsf{be\text{-}home}'(j)$

c. $\exists s(s \odot s^* \wedge \mathsf{be\text{-}home}'(s, j))$

wil-Type Verbs

(19) a. Hy wou huis toe stap.
he wanted.IMP house towards step

b. Toe wou/ wil hy huis toe stap.
then wanted.IMP/ wants.PRES he house towards step

c. Verlede week wou/ wil hy huis toe stap en daar sien hy sy buurman
last week wanted.IMP/ wants.PRES he house towards step ...
...

(20) Logical representation

a. Jan wil bel.
Jan want call 'Jan wants to call.'

b. $\mathsf{want}'(j.{}^\wedge(\mathsf{call}'(j))$

c. $\exists s(s \odot s^* \wedge \mathsf{want}'(s, j, {}^\wedge\exists s^*(s^* \approx s \wedge \exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e, j)))))$

${}^\wedge\phi$	intensionality operator
$s^* \approx s$	the embedded time s^* roughly coincides with s (usually it follows s (Katz, 2001))

Note that the base form *bel* has the same interpretation independent of whether it is used as a finite or as an infinitival form.

3.2 *Perfek*

Kleij (1999) shows that the *perfek* is interpreted as a preterite form in unembedded sentences.

(21) a. Môre sien ek hom.
tomorrow see.PRES I him 'I'll see him tomorrow.'
b. *Môre het ek hom gesien (en dan sal ek alles vir jou vertel).
tomorrow AUX I him seen.PART and then will I everything to you tell
c. Môre sal ek hom gesien het ...
tomorrow will I him seen.PART AUX ...

(22) a. Jan het gebel.
Jan AUX called.PART 'Jan called.'
b. $\textsc{past}(\mathsf{call}'(j))$
$\textsc{past}(\phi)$ there is a time t which precedes the speech time and ϕ happens at t.
c. $\exists t(t < s^* \wedge \exists e(\tau(e) \odot t \wedge \mathsf{call}'(e, j)))$
$<$ temporal precedences.

3.3 *Imperfek*

(23) a. Môre is Jan tuis.
tomorrow is.PRES Jan home 'Jan will be home tomorrow.'
b. *Môre was Jan tuis.
tomorrow was.IMP Jan home
c. Môre sal Jan tuis gewees het.
tomorrow will Jan home been.PART AUX
'Jan will have been home tomorrow.'

(24) a. Jan was tuis.
Jan was.IMP home 'Jan was home.'
b. $\textsc{past}(\mathsf{be\text{-}home}'(j))$
c. $\exists t(t < s^* \wedge \exists s(s \odot t \wedge \mathsf{be\text{-}home}'(s, j)))$

3.4 Aspectual Interpretation?

Kleij (1999) assumes that the *perfek* ambiguous between a preterite reading and a perfective reading.

(25) a. Nadat hy sy eksamen geskryf het, het hy koffie gedrink.
after he his exam written.PART AUX AUX he coffee drunk.PART
'After he had written his exam, he drank a coffee.'
b. Nadat ek hom môre gesien het, sal ek alles vir jou vertel.
after I him tomorrow seen.PART AUX will I everything to you tell
'After I have seen him tomorrow, I will tell you everything.'

- The "aspectual" reading only occurs in embedded clauses.
- The impossibility of the *perfek* combining with future adverbials such as *môre* (*tomorrow*) strongly suggests a purely temporal meaning (also argued for in Vos (2002)).
- The *imperfek* shows the same aspectual readings.

(26) a. 'n Tweedejaar mediesstudent ... moes uit selfverdediging 'n volstruismannetjie verwurg [**nadat** hy haar woedend **wou** aanval].
' A second year medical student had to strangle an ostrich [after it had wanted to attac her in a rage].'

b. Ek het, nadat ek ontslaan was, oor die algemeen gesond gevoel.
I AUX after I fired was.IMP in general healthy felt.PART
'After I had been fired, I generally felt healthy.'

$\Longrightarrow$ I assume that the aspectual effect can be accounted for by properties of connectors such as *nadat* (*after*) and by pragmatic considerations.

4 Temporal Interpretation in the Verbal Complex

4.1 Empirical Generalizations

G1 Every verb in *perfek* or *imperfek* introduces a past operator.

G2 The scope of a past tense is not fully determined by the verb which introduces the operator.

G3 The number of *perfek* and *imperfek* verbs determines the upper-bound of the number of past operators in a clause, but not the exact number.

G1 see (1).
PAST corresponds to the subformula: $\exists t(t < s^* \wedge \phi)$, where ϕ contains a free occurrence of t.

(27) a. Jan wou die boek gekoop het.
Jan wanted.IMP the book bought.PART AUX

b. First PAST operator:
$\underline{\text{PAST}}$(Jan wants(^PAST(Jan buys the book)))
$\underline{\exists t(t < s^* \wedge}\exists s(s \odot \underline{t} \wedge \mathsf{want}'(s, \mathsf{j}, {}^\wedge\exists s^*(s^* \approx s \wedge \exists t'(t' < s^* \wedge \exists e(\tau(e) \odot t' \wedge \mathsf{buy}'(e, \mathsf{j}, \mathsf{the\text{-}book}))))))$

c. Second PAST operator:
PAST(Jan wants(^$\underline{\text{PAST}}$(Jan buys the book)))
$\exists t(t < s^* \wedge \exists s(s \odot t \wedge \mathsf{want}'(s, \mathsf{j}, {}^\wedge\exists s^*(s^* \approx s \wedge \underline{\exists t'(t' < s^* \wedge}\exists e(\tau(e) \odot \underline{t'} \wedge \mathsf{buy}'(e, \mathsf{j}, \mathsf{the\text{-}book}))))))$

G2

(28) Jan wou die boek lees.
Jan wanted.IMP the book read

a. Jan wanted to read the book.
PAST(Jan wants ^(Jan reads the book))

b. Jan wants to have read the book.
Jan wants ^PAST(Jan reads the book)

(29) Jan wil die boek gelees het.
Jan wants.PRES the book read.PART AUX

a. Jan wants to have read the book.

b. Jan wanted to read the book.

(30) a. Ek moet los kon rondgeloop het.
I must.PRES freely can.IMP around.walked.PART AUX
'I had to be able to run around freely.' (Kleij, 1999)

b. PAST($\mathsf{must}'({}^\wedge\mathsf{can}'(i, {}^\wedge\mathsf{run\text{-}around\text{-}freely}'(i))))$

G3 see examples (1) and (28)–(30): There is never a reading with more PAST operators than there are *perfek* or *imperfek* forms in the clause. In particular, the hypothetical reading of (28) in (31) is not available:

(31) Jan wou bel.
Jan wanted.IMP call
$ Jan wanted to have called.
$ PAST(Jan wants ^PAST(Jan called))

4.2 The Traditional Analysis

(32) Operational account of the ambiguity (Ponelis, 1979; Kleij, 1999)

a. *preterite assimilation* (PA):

modal in *presens*	+	verb in *perfek*	⇒	modal in *imperfek* + verb in *perfek*
wil		geskryf het		wou geskryf het

PA derives the reading: Jan wants ^PAST(Jan writes)

b. *preterite movement* (PM):

modal in *imperfek*	+	verb in infinitive	⇒	modal in *imperfek* + verb in *perfek*
wou		skryf		wou geskryf het
1st modal in *imperfek*	+	2nd modal in *presens*	⇒	both modals in *imperfek*
wou		kan skryf		wou kon skryf

PM derives the reading: PAST(Jan wants ^(Jan writes))

Disadvantages of the operational account:

- The two operations are arbitrary.
- It is unclear how to encode it in a non-operational framework.
- There is no operation to account for the reading in ((30)), i.e., where the matrix verb *moet* is not marked as past, but interpreted as being in the scope of a PAST operator.

5 The Syntax-Semantics Interface

5.1 Transparent Logical Form

Assumptions in Stechow (1993), Beck (1996), Heim and Kratzer (1998), going back to Montague (1974); Partee (1984):

- There is a syntactic level of *Logical Form* (LF).
- Each sentence has a distinct LF for each of its readings.
- A reading is the result of applying an *interpretation function* to an LF:
  - lexical items receive their interpretation from the lexicon
  - the interpretation of a structure is the result of applying one out of a small number of interpretation rules to the interpretations of the immediate constituents of the structure (usually functional application).

Consequences:

- There is no explicit logical representation as part of the linguistic structure.
- The interpretation of a lexical item is a function.
- "Abstract" syntax is needed in cases where the occurrence of a particular overt lexical item in syntax leads to the occurrence of two (or more) functions in the semantic interpretation. (see Penka and von Stechow (2001))

Problems with the Afrikaans data:

- The occurrence of an *imperfek* form of a verb v in syntax triggers the occurrence of a PAST operator in the semantics in addition to the verb's lexical semantics. The relative scope (or c-command relation) of the two is, however, underspecified.
- Every *perfek* and *imperfek* form can contribute a PAST operator. The semantic combinatorics cannot ignore any contributed operator. Therefore, for the readings with less operators than PAST-marked verb forms a lexical ambiguity of these forms must be assumed.
- To avoid such ambiguity, a process of PAST-factorization would be needed.

5.2 Explicit Semantic Representations

The *logical form* in May (1989).

Assumptions in Discourse Representation Theory (DRT, Kamp (1981); Kamp and Reyle (1993)):

- A syntactic level of representation is not interpreted directly, but rather translated into a logical representation (such as a Discourse Representation Structure in the case of DRT)
- This logical representation is used to determine the interpretation of pronouns, scope, and many others.
- The lexicon determines the translation of lexical items. The syntactic structure determines the translation of complex structures.

Assumptions in this paper:

- Analogous to those in DRT.
- I will use a more standard semantic representation language (Ty2 of Gallin (1975) and Groenendijk and Stokhof (1982)).
- I will specify a particular translation algorithm.

6 Lexical Resource Semantics (LRS)

6.1 General Properties

- See Richter and Sailer (2004a) for an introduction to *Lexical Resource Semantics*.
- LRS combines the techniques of underspecified semantics (Reyle, 1993; Bos, 1996; Pinkal, 1996) with the properties of model-theoretic grammar Pollard and Sag (1994); Pullum and Scholz (2001) to yield a new system for phrasal semantics.
- Richter and Sailer (2004a) compares the architecture of LRS with that of other systems for compositional semantics. For the present purpose, we will confine ourselves to presenting the principle ideas of LRS:
  - the use of standard semantic representation languages (a version of intensional predicate logic such as IL (Montague, 1974) or Ty2 (Gallin, 1975))
  - concise encoding of scope ambiguities (without storage (Cooper, 1975, 1983; Pollard and Sag, 1994), movement (May, 1985) or type shifting (Hendriks, 1993; Sailer, 2003))
  - direct account of discontinuous semantic contributions
  - natural expression of semantic concord phenomena by identities (Richter and Sailer, 2001a,b)
  - modular separation of local (lexical?) semantics and clausal semantics (Sailer, 2004a)

The important innovation of LRS is that the semantic contribution of a sign is no longer represented as a single expression, instead it is broken down into all its subexpressions.

6.2 Definitions and Examples

(33) Definition of the meta language $\mu(L)$;

For a semantic representation language L, the set of *meta expressions* of L ($\mu(L)$) is the smallest set such that,

there is a set VAR of meta variables, and
for each $\phi \in L$, $\phi \in \mu(L)$,
for each $V \in VAR$, for each n-tuple $\phi_1, \ldots \phi_n$ with $\phi_i \in \mu(L)$, $V[\phi_1, \ldots . \phi_n] \in \mu(L)$,
for each $\phi, \psi \in \mu e(L)$, for each variable v of L, $\neg\phi$, $\phi \wedge \psi$, $\phi \vee \psi$, $\ldots$, $\exists v\phi$, $\forall v\phi \in \mu(L)$.

For convenience we will write $\vec{\phi}$ for n-tuples of $\mu(L)$ expressions. We also allow 0-tuples and write V for $V[\,]$.

(34) Denotation of expressions of $\mu(L)$:

Since $\mu(L)$ is a meta language, expressions of $\mu(L)$ denote expressions of L. This denotation is defined with respect to a meta variable assignment function ASS, which assigns an expression of L to each element of VAR . We will write $[\![\phi]\!]^{ASS}$ for this meta denotation.

- For each $\phi \in L$, $[\![\phi]\!]^{ASS} = \phi$.
- Expressions of the form $V[\phi_1, \ldots, \phi_n]$ are interpreted as $ASS(V)$ if for each ϕ_i, $[\![\phi_i]\!]^{ASS}$ is a subexpression of $ASS(V)$. Otherwise the denotation is undefined.
- The denotation of syntactically complex expressions is defined recursively. For example, the denotation of $\phi \wedge \psi$ is the L expression $[\![\phi]\!]^{ASS} \wedge [\![\psi]\!]^{ASS}$.

(35) Definition of a *reading*:

For each $\phi \in \mu(L)$, $\phi_{lf} \in L$, ϕ_{lf} *is a reading* of ϕ, iff there is a meta variable assignment function ASS such that

(i) $\phi_{lf} = [\![\phi]\!]^{ASS}$, and
(ii) for each ψ which is a subexpression of ϕ_{lf},
if ψ is a variable or a constant, then ψ is a subexpression of ϕ,
if ψ is of the form $\psi_1 \wedge \psi_2$, then there is a ψ' such that
ψ' is a subexpression of ϕ and has the form $\psi'_1 \wedge \psi'_2$,
where $[\![\psi'_1]\!]^{ASS} = \psi_1$ and $[\![\psi'_2]\!]^{ASS} = \psi_2$,
analogously for the other complex expressions of L.

A reading of a $\mu(L)$ expression ϕ is an interpretation of this expression (clause (i)). This condition guarantees that all the L variables, constants and connectors that occur in ϕ will also be present in the reading ϕ_{lf}. In addition, the second clause imposes an exhaustivity condition on this interpretation: every subexpression of ϕ_{lf} must appear in ϕ, possibly in "disguised" form by the presence of meta variables.

(36) a. $A[\mathsf{call}'(e, j)]$
b. Possible denotation of (a): any expression which contains $\mathsf{call}'(e, j)$ as a subexpression.
c. Reading of (a): $\mathsf{call}'(e, j)$

(37) Definition of an *lrs*:

An *lrs* is a triple of $\mu(L)$ expressions $\langle \phi, \phi_-, \phi_\# \rangle$. We will call ϕ the *parts structure* of the *lrs*, ϕ_- the *internal content* and $\phi_\#$ the *external content*.

For each *lrs*, $\langle \phi, \phi_-, \phi_\# \rangle$.

- ϕ_- is a subexpression of ϕ,
- there is a meta variable assignment ASS such that
  - $[\![\phi_-]\!]^{ASS}$ is a subexpression of $[\![\phi_\#]\!]^{ASS}$, and
  - $[\![\phi_\#]\!]^{ASS}$ is a subexpression of $[\![\phi]\!]^{ASS}$.

Short hand notation for *lrs*:

(38) a. $\langle A[s^*, \exists e(\tau(e) \odot T \wedge B[\mathsf{call}'(e,j)])],$ (parts structure)
$\mathsf{call}'(e,j),$ (internal content)
$A\rangle$ (external content)

b. $^{\#}A[s^*, \exists e(\tau(e) \odot T \wedge B[\underline{\mathsf{call}'(e,j)}])]$

The three parts of an *lrs*:

- The *parts structure* contains all subexpressions which are contributed by a node in the syntactic structure.
- The *internal content* is the subexpression which is in the scope of all higher scope-taking operators.
- the *external content* is the expression which is associated with the logical form of a phrase.

The *lrs* in (38) is the lexical specification of the semantic contribution of the verb *bel* (*call*). This *lrs* contains exactly all the subexpressions which are invariably present whenever the verb *bel* occurs:

(39) a. Jan bel.
$\underline{\exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e,j))}$

b. Jan wil bel.
$\exists s(s \odot s^* \wedge \mathsf{want}'(s, j, {}^\wedge\exists s^*(s^* \approx s \wedge \underline{\exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e,j))})))$

c. Jan wou bel. (want(PAST)-reading)
$\exists s(s \odot s^* \wedge \mathsf{want}'(s, j, {}^\wedge\exists s^*(s^* \approx s \wedge \exists t(t < \underline{s^*} \wedge \underline{\exists e(\tau(e) \odot} \; t \; \underline{\wedge \mathsf{call}'(e,j))})))$

(40) Reading of (38):

a. $\exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e,j))$

b. Meta variable assignment:

$T = s^*$
$A = \exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e,j))$
$B = \mathsf{call}'(e,j)$

At the level of an utterance, it must be possible to interpret an *lrs* in such a way that no additional material from the semantic representation language needs to be added:

(41) The EXTERNAL CONTENT PRINCIPLE:

Let $\langle \phi, \phi_-, \phi_\# \rangle$ be the *lrs* of an utterance, then $\phi_\#$ is a reading of ϕ.

The analogon to the semantic interpretation rules in TLF are constraints which will be added along the syntactic structure. The following definition states what we understand by a such a constraint.

(42) a. Definition of a *constraint lrs*:

A *constraint lrs* is a pair $\langle \lambda, \kappa \rangle$, where λ is an *lrs* and κ is a finite set of constraints of one of the following two forms:

- $\phi \lhd V$ ("ϕ is a subexpression of V"), where $\phi \in \mu(L)$, and $V \in VAR$ both occurring in λ, or
- $\phi = \psi$ ("ϕ and ψ are identical"), where ϕ, ψ both occur in λ.

b. Constraint elimination:

Every constraint *lrs* can be rewritten as a normal *lrs* applying the following algorithm:

- To eliminate a constraint of the form $\phi \lhd V$, replace each $V[\vec{\psi}]$ in λ with $V[\vec{\psi}, \phi]$.
- For constraints of the form $\phi = \psi$ we will take a meta variable W which does not occur in λ and replace each occurrence of ϕ and ψ with $W[\phi, \psi]$.

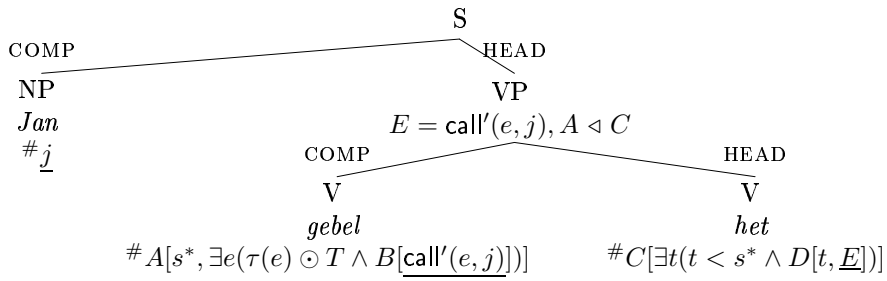


Figure 1: The structure of *(dat) Jan gebel het*

The *Semantics Principle* lists the kinds of constraints which will be added at different syntactic nodes.

(43) The *Semantics Principle* (SP):

Let $\langle \phi, \phi_-, \phi_\# \rangle$ be the *lrs* of the head daughter, $\langle \psi, \psi_-, \psi_\# \rangle$ the *lrs* of the nonhead daughter, and V a meta variable which does not occur in either *lrs*,
then the *lrs* of the mother results from eliminating the constraints from

$$\langle \langle V[\phi, \psi], \phi_-, \phi_\# \rangle, \kappa \rangle,$$

where κ contains exactly the following constraints:

1. $\phi_\#$ is of the form $\beta[\vec{\phi}]$, and $\psi_\# \lhd \beta$ is in κ,
2. Specific Constraints:
   (a)...
   (b)...
   (c)if the non-head is a raised complement of the head, then $\phi_- = \psi_-$,
   (d)...

(44) Lexical specification:

a. *Jan*: $^{\#}\underline{j}$
b. *gebel*: $^{\#}A[s^*, \exists e(\tau(e) \odot T \wedge B[\underline{\mathsf{call}'(e,j)}])]$
c. *het*: $^{\#}C[\exists t(t < s^* \wedge D[t, \underline{E}])]$

Note:

- The lexical specification of the past participle *gebel* is identical with that of the base form *bel* in (38).
- The auxiliary *het* contributes the PAST operator.

(45) a. Constraint *lrs* of the S node in Figure 1:

$$\langle F[^{\#}C[\exists t(t < s^* \wedge D[t, \underline{E}])], A[s^*, \exists e(\tau(e) \odot T \wedge B[\mathsf{c}'(e,j)])]], \{A \lhd C, \mathsf{c}'(e,j) = E\} \rangle$$

b. After constraint elimination:

$$F[^{\#}C[\exists t(t < s^* \wedge D[t, G[\underline{E}, \mathsf{call}'(e.j)]]), A[s^*, \exists e(\tau(e) \odot T \wedge B[G[\underline{E}, \mathsf{call}'(e,j)]])]],$$
$$A[s^*, \exists e(\tau(e) \odot T \wedge B[G[\underline{E}, \mathsf{call}'(e,j)]])]]$$

(46) a. Meta variable assignment:

$T = t$
$A = C = F = \exists t(t < s^* \wedge \exists e(\ldots))$
$B = E = G = \mathsf{call}'(e,j)$
$D = \exists e(\tau(e) \odot t \wedge \mathsf{call}'(e,j))$

b. Resulting reading:

$\exists t(t < s^* \wedge \exists e(\tau(e) \odot t \wedge \mathsf{call}'(e,j)))$

(47) a. (dat) Jan wil bel
that Jan want.PRES call

b. Lexical specification for *wil*:

$^{\#}F[s^*, \exists s(s \odot T' \wedge \mathsf{want}'(s,j,{}^\wedge\exists s^*(s^* \approx s \wedge G[s^*, \underline{H}])))]$

(48) a. Meta variable assignment:

$T = s^* \qquad T' = s^*$
$A = G = \exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e,j))$
$B = H = \mathsf{call}'(e,j))$
$F = \exists s(s \odot s^* \wedge \mathsf{want}'(s,j,{}^\wedge\exists s^*(s^* \approx s \wedge \exists e(\ldots))))$

b. Resulting reading:

$\exists s(s \odot s^* \wedge \mathsf{want}'(s,j,{}^\wedge\exists s^*(s^* \approx s \wedge \exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e,j)))))$

7 Analysis of Example (1)

7.1 *wou* (*wanted.IMP*)

(49) Lexical specification of *wou* (*wanted.IMP*):

$^{\#}I[\exists t(t < s^* \wedge J[t, \underline{K}]), \exists s(s \odot T' \wedge \mathsf{want}'(s,j,{}^\wedge\exists s^*(s^* \approx s \wedge L[s^*, \underline{K}])))]$

Note that the relative scope of the PASToperator ($\exists t(t < s^* \wedge J[t, \underline{K}])$) and of the lexical semantics of the verb *wil* ($\exists s(s \odot T' \wedge \mathsf{want}'(s,j,{}^\wedge\exists s^*(s^* \approx s \wedge L[s^*, \underline{K}]))))$ is not specified!

(50) (dat) Jan wou bel
that Jan want.IMP call

a. $\exists t(t < s^* \wedge \exists s(s \odot t \wedge \mathsf{want}'(s,j,{}^\wedge\exists s^*(s^* \approx s \wedge \exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e,j))))))$

b. $\exists s(s \odot s^* \wedge \mathsf{want}'(s,j,{}^\wedge\exists s^*(s^* \approx s \wedge \exists t(t < s^* \wedge \exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e,j))))))$

(51) a. Meta variable assignment of the (a)-reading:

$T = s^* \qquad T' = t$
$A = L = \exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e,j))$
$B = K = \mathsf{call}'(e,j)$
$I = \exists t(t < s^* \wedge \exists s(\ldots))$
$J = \exists s(s \odot t \wedge \mathsf{want}'(s,j,{}^\wedge\exists s^*(\ldots)))$

b. Meta variable assignment of the (b)-reading:

$T = s^* \qquad T' = s^*$
$A = I = \exists s(s \odot s^* \wedge \mathsf{want}'(s,j,{}^\wedge\exists s^*(s^* \approx s \wedge \exists t(\ldots))))$
$B = K = \mathsf{call}'(e,j)$
$J = \exists e(\tau(e) \odot t \wedge \mathsf{call}'(e.j))$
$L = \exists t(t < s^* \wedge \exists e(\ldots)$

(52) (dat) Jan wou gebel het
that Jan want.IMP call.PART AUX

a. $\exists t(t < s^* \wedge \exists s(s \odot t \wedge \mathsf{w}'(s,j,{}^\wedge\exists s^*(s^* \approx s \wedge \exists t(t < s^* \wedge \exists e(\tau(e) \odot t \wedge \mathsf{c}'(e,j)))))))$

b. $\exists s(s \odot s^* \wedge \mathsf{w}'(s,j,{}^\wedge\exists s^*(s^* \approx s \wedge \exists t(t < s^* \wedge \exists e(\tau(e) \odot t \wedge \mathsf{c}'(e,j))))))$

c. $\exists t(t < s^* \wedge \exists s(s \odot t \wedge \mathsf{w}'(s,j,{}^\wedge\exists s^*(s^* \approx s \wedge \exists e(\tau(e) \odot t \wedge \mathsf{c}'(e,j))))))$

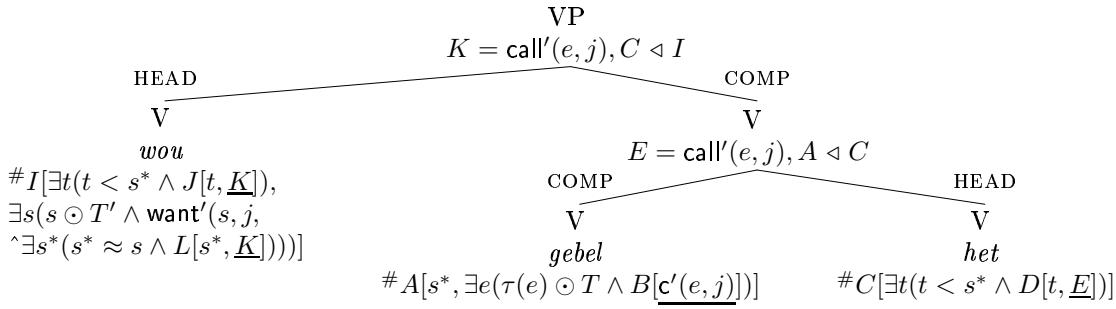


Figure 2: The structure of the verbal complex *wou gebel het*

(53) a. Meta variable assignment of the (a)-reading:

$T = t \qquad T' = t$
$A = C = L = \exists t(t < s^* \wedge \exists e(\ldots))$
$B = E = K = \mathsf{call}'(e, j)$
$D = \exists e(\tau(e) \odot t \wedge \mathsf{call}'(e, j))$
$I = \exists t(t < s^* \wedge \exists s(\ldots))$
$J = \exists s(s \odot t \wedge \mathsf{want}'(s, j, \hat{}\exists s^*(\ldots)))$

b. Meta variable assignment of the (b)-reading:

$T = t \qquad T' = s^*$
$A = C = L = \exists t(t < s^* \wedge \exists e(\ldots))$
$B = E = K = \mathsf{call}'(e, j)$
$D = J = \exists e(\tau(e) \odot t \wedge \mathsf{call}'(e, j))$
$I = \exists s(s \odot s^* \wedge \mathsf{want}' s, j, \hat{}\exists s^*(\ldots))$

c. Meta variable assignment of the (c)-reading:

$T = s^* \qquad T' = t$
$A = L = \exists e(\tau(e) \odot s^* \wedge \mathsf{call}'(e, j))$
$B = E = K = \mathsf{call}'(e, j)$
$C = I = \exists t(t < s^* \wedge \exists s(s \odot t \wedge \mathsf{want}'(s, j, \hat{}\exists s^*(\ldots)))$
$D = J = \exists s(s \odot t \wedge \mathsf{want}'(s, j, \hat{}\exists s^*(\ldots)))$

7.2 Excluded Interpretations

***PAST(PAST(ϕ))**

(54) (dat) Jan die boek wou gekoop het
that Jan the book want.IMP bought AUX

a. $ PAST(PAST($\mathsf{want}'(j, \hat{}\mathsf{call}'(j))$))
b. $ $\mathsf{want}'(j, \hat{}$PAST(PAST($\mathsf{call}'(j)$))

In these readings, the logical representation would be $\exists t[t < s^* \wedge \exists t'[t' < t \wedge \phi]$. For Afrikaans, however, we have assumed that the past tense operator always mentions the speech time explicitly.

Clause-Boundedness While the scope of a past operator is underspecified within the verbal complex, it must be interpreted within the same clause.

(55) Jan sê dat Marie gebel het.
Jan says.PRES that Marie called.PART AUX

a. says(Jan, PAST(Marie calls))
b. $ PAST(says(Jan, Marie calls))

(56) Lexical specifications:

sê: $^{\#}M[\exists e'(\tau(e') \odot T' \wedge N[\underline{\mathsf{say}'(e', j, O)}])]$
gebel: $^{\#}A[s^*, \exists e(\tau(e) \odot T \wedge B[\underline{\mathsf{call}'(e, j)}])]$
het: $^{\#}C[\exists t(t < s^* \wedge D[t, \underline{E}])]$

(57) Extension of the SEMANTICS PRINCIPLE:

2. (d)If the non-head is a complement clause, then ϕ_- is of the form $\mathsf{constant}'(x_1, \ldots, x_n, \alpha)$, and $\psi_\# \lhd \alpha$ is in κ.

8 Summary

- The analysis follows directly from the properties of LRS.
- Further development of LRS:
  - Multiple exponence:

    (58) a. Interrogative operator (Richter and Sailer, 2001a):
    German: **Wer** hat **welches** Buch gelesen?
    who has which book read 'Who read which book?'

    b. Negation operator (Richter and Sailer, 2001b, 2004a):
    Polish: **Nikt** **nie** pomaga **nikomu**.
    nobody NEG helped nobody 'Nobody helped anybody.'

    c. Tense (Sailer, 2004b)

  - Copies in the logical representations (instead of identities): non-restrictive relative clauses (Sailer, 2004c)
- Further issues with respect to Afrikaans:
  - Extending the analysis to sequence-of-tense and to temporal adverbials in Afrikaans (Villiers, 1971).
  - Further problems within the temporal domain: "displaced participles" (Vos, 2002):

    (59) Hy't aanhou **ge**rondloop tot hy gevang is.
    he AUX keep on round-walk.PART until he caught.PART is
    'He kept on walking around until he was caught.'

  - Can all instances of multiple exponence in Afrikaans be accounted for in semantic terms? or is some of it purely morphological or syntactical?
  - Comparison with the tense systems in other Germanic languages (e.g. "double perfect" in Yiddish and Southern German, "preterite assimilation" in varieties of English)

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