



Nominalizations, Sortal Ambiguity and Ontological Commitment

Semantics and Philosophy in Europe 5

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Outline

Sortally ambiguous -ung Nominalizations


Two approaches to sortal ambiguity

Underspecified object-language ontology

Example representations

Reidentification

Underspecification and ontological commitment



Focus of this Talk

- Ontology of sortally ambiguous german -ung Nominalizations?
- ⇒ Ontological commitment involved in -ung Nominalization pertains to underspecified semantic representations of linguistic meaning.



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Sortal ambiguity of -ung Nominalizations

Hamm and Kamp (2009): Many german -ung nominals are ambiguous between an entity-, an event- and a state-denoting reading:

- (1) Die Absperrung der Botschaft wurde angestrichen.
The barricade of the embassy was painted.
- (2) Die Absperrung der Botschaft wurde behindert.
The blocking-off of the embassy was hampered.
- (3) Die Absperrung der Botschaft wurde aufgehoben.
The blocking-off of the embassy was lifted.

Semantic representation of sortal ambiguity

Hamm and Solstad (2010)'s representation of "Absperrung" in Discourse Representation Theory (Kamp et al. (2011))

(4)

z $\alpha = e \overset{!}{\vee} \alpha = s \overset{!}{\vee} \alpha = y$ $\textit{Absperrung}(\alpha)$ $e \text{ CAUSE } s$ $s : \textit{have}(y, z)$ $\textit{function-as-barrier}(y)$ $\textit{Agent}(e) = x$

- Sortal ambiguity of "Absperrung" at the NP-level: disjunction operator $\overset{!}{\vee}$ (Reyle et al. (2007)).
- Disambiguation of α at the VP-level via selection restrictions of the container verb (disjunct deletion).

A note on the derivation of the DRS for “Absperrung”

- Semantic representation for “Absperrung” is produced systemically from the semantic interpretation of syntactic structures.
- Root-based semantics combines distributed morphology Halle and Marantz (1993) with DRT Roßdeutscher and Kamp (2010); Lechler and Roßdeutscher (2009).



Reambiguation

There is an additional complication involved in the proper treatment of sortal ambiguity (Hamm and Solstad (2010)):

- Possibility of anaphoric access to an -ung Nominalization, where the selection restriction for the sort of the anaphor differs from the sort of the -ung Nominalization identified in the antecedent sentence (“transsentential sort clash”).

⇒ “Reambiguation” of the disambiguated -ung Nominalization.

Reambiguation: Example

- (5) Die Absperrung des Rathauses wurde
The cordoning-off of the town hall was
vorgestern von Demonstranten behindert.
the day before yesterday by protesters hampered.
Wegen anhaltender Unruhen wird sie heute
Due to continuing unrest, is it today
aufrecht erhalten.
sustained.

The cordoning-off of the town hall was hampered by protesters the day before yesterday. Due to continuing unrest, it is sustained today as well.

Sortal ambiguity and Ontological Commitment

- What are the ontological properties of sortally ambiguous -ung Nominalizations and their semantic representations?
- Do ambiguous -ung Nominalizations have a denotation and if yes of what kind is this denotation?
- What do sortally ambiguous nominalizations imply with respect to ontological commitment?
- In order to explore these questions, I start with a discussion of two answering strategies:
Hamm and Solstad (2010)'s Logic Programming Approach
and Pustejovsky (1998)'s Dot Types.



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Logic Programming Approach, Hamm and Solstad (2010)

- \checkmark : Dubious status of the denotation of “Absperrung” as either an event or a thing or a state (are there such objects?).
- Reambiguation: process of non-monotonic inference from the event of cordoning-off to its result state is supposed to underlie the ontology of german -ung nominalization.
- There is no functional mapping from LFs to meanings in a disjunction approach, in Hamm and Solstad (2010)’s approach this mapping is even non-monotonic.
- How should we represent the “reambiguous” discourse referent “Absperrung” and at the same time keep track of the previous resolution? (Hamm and Solstad (2010) remain silent on this point).

Should we commit to non-monotonicity of meaning and a central role of cognitive processing?

Dot-object Approach, Pustejovsky (1998) I

Given “Absperrung” denotes a single object with complex type $\tau(\textit{Absperrung}) := \textit{event} \otimes \textit{entity} \otimes \textit{state}$, disambiguation picks out one “aspect” of the object.

- But: (Fodor and Lepore, 1998, p. 280): “all that’s happened is that it [the problem] has been kicked upstairs from the semantics to the ontology”
- How about verbs with ambiguous selection restrictions (“verschieben”/move)?
- Complex ontology through the combinatorial explosion of types.
- Inherits the problems of Aristotelian metaphysics with “substantial change” (“zerstören” (destroy) is not an instance of coercion).

Dot-object Approach, Pustejovsky (1998) II

- If there is no local type clash, what triggers the coercion process?

Should we commit to “common-sense metaphysics” and thus a central role of “the world”?



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Underspecified ontology

- Proposal: -ung Nominalizations have an underspecified ontology, in the sense of semantic underspecification in Reyle (1993)'s Underspecified DRT (UDRT).
 - Sort of -ung Nominalization is underspecified until it is “coined” by selection restrictions of container verbs (or other means of linguistic specification).
- ⇒ Deal with sortal ambiguity directly at the level of the object language of DRSs, not at the level of cognitive processing or the world itself.

DRS for “Absperrung”

Recall Hamm and Solstad (2010)'s DRS for “Absperrung”:

(6)

z
$\alpha = e \dot{\vee} \alpha = s \dot{\vee} \alpha = y$
$\text{Absperrung}(\alpha)$
$e \text{ CAUSE } s$
$s : \text{have}(y, z)$
$\text{function} - \text{as} - \text{barrier}(y)$
$\text{Agent}(e) = x$

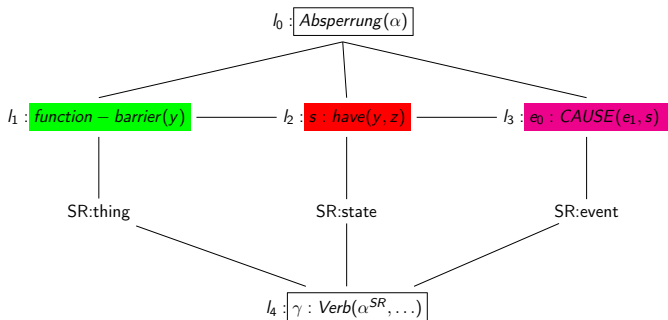
Object-language ontology

- The DRS (6) already contains the required ontological elaborations of “Absperrung”.
- Ontologically, “Absperrung” is identified in the DRS through different (but standardized) means:
 - “thing”: conceptualized via properties/functions
function – as – barrier(y)
 - “event”: conceptualized via causal relationships with other events/states
 $e_0 : CAUSE(e_1, s)$
 - “state”: conceptualized via a combination of properties and causal relationships
 $s : have(y, z)$

Underspecification of conceptualization I

- Break up the DRS into single “identification” conditions for α .
 - Arrange the “identification” conditions for α in an algebraic structure.
 - Structural underspecification of identification and consequent ontological coinage of α .
- ⇒ Selection restrictions (and the lexical semantics) of the container verb determine the structural und thus ontological specification of α .

Underspecification of conceptualization II



Selection restrictions and identification criteria

- Underspecification imposes meta-level constraints
- Meta-level constraints are captured as ontological “templates” (tree-like substructures of the algebra) associated with the lexical semantics of the container verb:
 - On the identification of the ontological sort of the arguments of the container verb.
 - On the set of appropriate semantic representations: possible DRS representations are derived by collecting conditions along paths specified by meta-level constraints.



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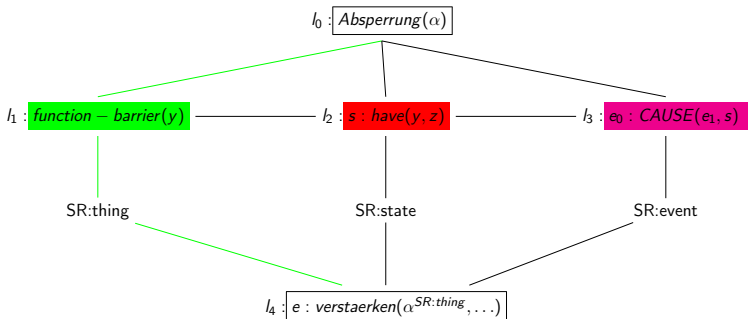
Reidentification

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Selection restriction: thing

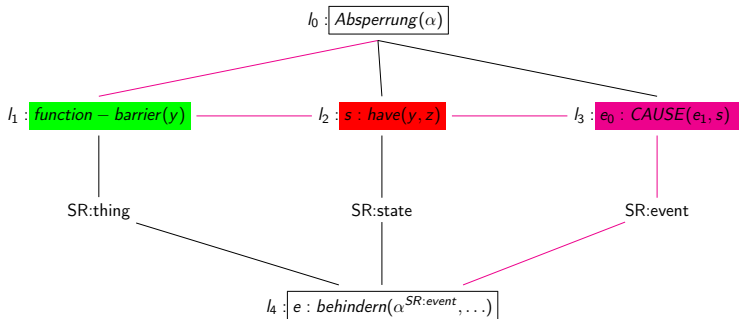
(7) Template: $verstaerken(\alpha^{SR:thing}, \dots)$ (*fortify*);

$l_4 \text{ --- } l_1 \text{ --- } l_0$



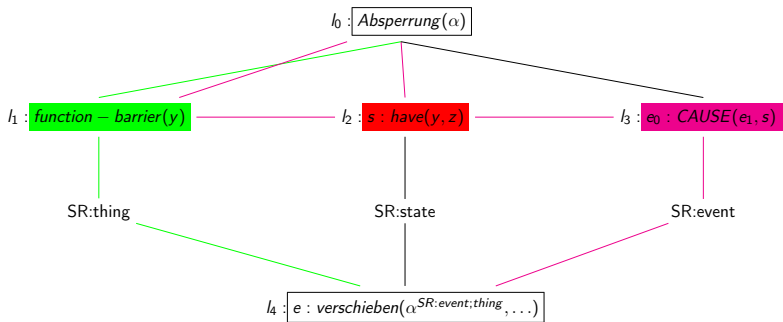
Selection restriction: event

(8) Template: *behindern*($\alpha^{SR:event}, \dots$) (*hamper*);
 $l_4 \text{ --- } l_3 \text{ --- } l_2 \text{ --- } l_1 \text{ --- } l_0$



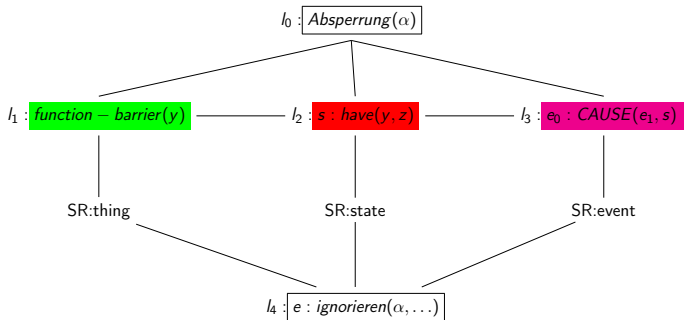
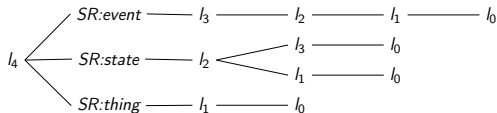
Underspecified selection restriction

(10) Template: $verschieben(\alpha^{SR:thing;event}, \dots)$ (*move*);



Underspecified selection restriction, underspecified identification

(11) Template: *ignorieren*(α, \dots) (*ignore*);





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Reidentification and Templates

- Reidentification pertains to the possibility of anaphoric access to an -ung Nominalization, where the selection restriction for the sort of the anaphor differs from the already identified sort of the -ung Nominalization (“transsentential sort clash”).
 - Reidentification results from the application of two or more templates to the same underspecified representation.
 - Use identified DRS conditions for the control of anaphora resolution (+ lexical semantics, excluded here).
- ⇒ Reidentification depends on the availability of DRS conditions wrt. to α .

Reidentification I

- (12) Die Absperrung des Rathauses wurde
The cordoning-off of the town hall was
vorgestern von Demonstranten behindert.
the day before yesterday by protesters hampered.
Wegen anhaltender Unruhen wird sie heute aufrecht
Due to continuing unrest, is it today sustained.
erhalten.

The cordoning-off of the town hall was hampered by protesters the day before yesterday. Due to continuing unrest, it is sustained today as well.

Reidentification II

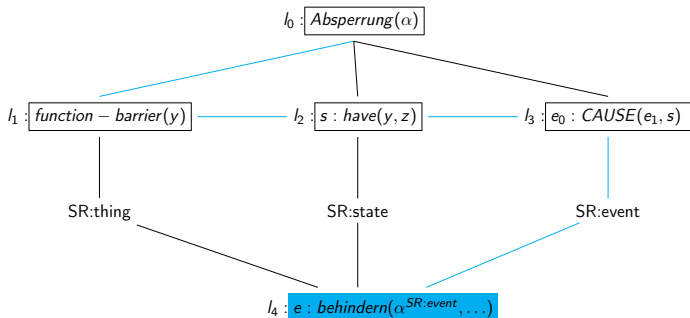
(13) *behindern*($\alpha^{SR:event}, \dots$) (*hamper*);

$$l_4 \text{ --- } l_3 \text{ --- } l_2 \text{ --- } l_1 \text{ --- } l_0$$

(14) *aufrecht – erhalten*($\alpha^{SR:state}, \dots$) (*sustain*);

$$l_4 \text{ --- } l_2 \begin{cases} l_1 \text{ --- } l_0 \\ l_3 \text{ --- } l_0 \end{cases}$$

Reidentification III





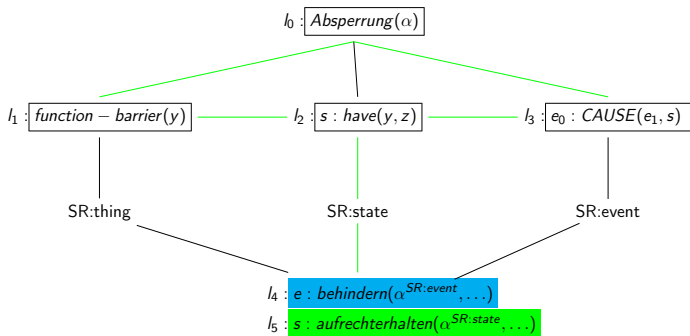
DRS

Preliminary DRS after the application of the template for
“behindern” (hamper):

(15)

$\alpha, z, e, y, e_1, e_2, s$
Absperrung(α)
 e CAUSE s
 s : *have*(y, z)
function – as – barrier(y)
 e_1 : *behindern*(e_2, \dots)
 $e_2 = e$
 $e = \alpha$

Reidentification I





DRS

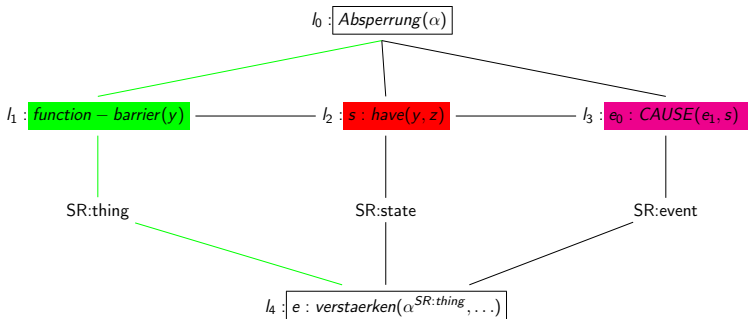
Preliminary DRS after the application of the template for “behindern” (hamper) and “aufrecht erhalten” (sustain)

(16)

$e, \alpha, s, y, e, e_0, e_2, z, s_0, s_1$
$Absperrung(\alpha)$
$e \text{ CAUSE } s$
$s : have(y, z)$
$function - as - barrier(y)$
$e_0 : behindern(e_2, \dots)$
$e_2 = e$
$e = \alpha$
$s_0 : aufrecht - erhalten(s_1, \dots)$
$s_1 = s$
$s = \alpha$

Reidentification: Blocking I

- (17) * Die Abspernung des Rathauses wurde heute
The cordoning-off the town hall was fortified
 verstärkt. Sie wurde gestern massiv behindert.
today. It was massively hampered yesterday.





DRS

Preliminary DRS after the application of the template for “verstaerken” (fortify).

$$(18) \quad \begin{array}{l} \alpha, y, e \\ \textit{Absperrung}(\alpha) \\ \textit{function - as - barrier}(y) \\ e : \textit{verstarken}(y) \\ y = \alpha \end{array}$$

DRS

Preliminary DRS after the application of the template for “verstaerken” (fortify) and “behindern” (hamper).

$$\begin{array}{l}
 (19) \quad y, e, y_1, e_0, e_1, \alpha \\
 \quad \textit{Absperrung}(\alpha) \\
 \quad \textit{function} - \textit{as} - \textit{barrier}(y) \\
 \quad e : \textit{verstarken}(y_1) \\
 \quad y_1 = y \\
 \quad y = \alpha \\
 \quad e_0 : \textit{behindern}(e_1, \dots) \\
 \quad e_1 = ?
 \end{array}$$

The DRS specified by *verstaerken* does not contain temporal conditions, consequently, there is no way to reidentify “Absperrung” as a temporal entity, which would be required by the template for “behindern”.



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Underspecified commitment

- Object-Language (DRS) treatment of the ontology of ambiguous german -ung nominalizations.
- Underspecification of the ontology of -ung nominalizations.
- Commitment pertains to the availability of (underspecified) semantic representations of natural language.
- No additional commitment to claims about the “world” or the cognitive apparatus of humans, but:
⇒ Original conception of DRT, where “discourse representations can be regarded as the mental representations which speakers form in response to the verbal inputs they receive.” (Kamp, 1984, p. 5), here: nothing else is necessary besides these representations.



Outlook

- What are the linguistic, cognitive, philosophical, . . . criteria for “finalizing” (under)specification?
- Does the picture change with the incorporation of additional sorts for regions (“Öffnung”, opening), rules (“Regelung”, rule), . . . (Roßdeutscher (2010))?
- Interaction between underspecification and complex lexical semantics of verbs? (“verhindern” (prevent), “zerstören” (destroy), “wieder aufbauen” (reconstruct))



Outlook

- Further exploration of underspecification: How is underspecified ontology involved in further reasoning tasks?
 - That is, is there an ontological equivalent to the deduction procedures on UDRSs?
 - This talk has explored this equivalence only in a preliminary manner (the blocking of anaphora-triggered reidentification), but I think that a full-fledged equivalent would constitute the appropriate type of ontological commitment involved in sortally ambiguous nominalizations and other linguistic expressions.



Thank you.



References I

- Fodor, J. A. and Lepore, E. (1998). The emptiness of the lexicon: Reflections on James Pustejovsky's 'the generative lexicon'. *Linguistic Inquiry*, 29(2):269 – 288.
- Halle, M. and Marantz, A. (1993). Distributed morphology and the pieces of inflection. In Hale, K. and Keyser, S. J., editors, *The View from Building 20*, pages 111–176. MIT Press, Cambridge.
- Hamm, F. and Kamp, H. (2009). Ontology and inference: The case of German un-g-nominals. In Rosseideutscher, A., editor, *Disambiguation and Reambiguation*, volume 6 of *Working Papers of the SFB 732 "Incremental Specification in Context"*.



References II

- Hamm, F. and Solstad, T. (2010). Reambiguation: on the non-monotonicity of disambiguation. In Bonami, O. and Cabredo Hofherr, P., editors, *Empirical Issues in Syntax and Semantics*, volume 8, pages 1 – 28.
- Kamp, H. (1984). A theory of truth and semantic representation. In Groenendijk, J., Janssen, T. M. V., and Stokhof, M., editors, *Truth, Interpretation and Information: Selected Papers from the Third Amsterdam Colloquium*, pages 1–41. Foris Publications, Dordrecht.
- Kamp, H., van Genabith, J., and Reyle, U. (2011). *Handbook of Philosophical Logic*, volume 15, chapter Discourse Representation Theory, pages 125 – 394. Springer, 2nd edition.



References III

- Lechler, A. and Roßdeutscher, A. (2009). German particle verbs with *auf*. reconstructing their composition in a drt-based framework. *Linguistische Berichte*, 220:439–478.
- Pustejovsky, J. (1998). The semantics of lexical underspecification. *Folia Linguistica*, 32(3-4):323–348.
- Reyle, U. (1993). Dealing with ambiguities by underspecification: Construction, representation and deduction. *Journal of Semantics*, 10(2):123 – 179.
- Reyle, U., Rossdeutscher, A., and Kamp, H. (2007). Ups and downs in the theory of temporal reference. *Linguistics and Philosophy*, 30(5):565 – 635.



References IV

Roßdeutscher, A. (2010). German -ung-formation. an explanation of formation and interpretation in a root-based account. In Olsen, S., editor, *New Impulses in Word-Formation*, Special issue 117 of *Linguistische Berichte*. Helmut Buske, Hamburg.

Roßdeutscher, A. and Kamp, H. (2010). Syntactic and semantic constraints in the formation and interpretation of ung-nouns. In Alexiadou, A. and Rathert, M., editors, *Nominalisations across Languages and Frameworks*, chapter Syntactic and Semantic Constraints in the Formation and Interpretation of ung-Nouns. Mouton de Gruyter, Berlin.

Naive disambiguation: disjunct deletion

Naive approach to the disambiguation of “Absperrung”:

- Delete \checkmark disjuncts according to the selection restrictions of the container verb.

⇒ Wrong predictions with respect to anaphora resolution (state-reading is no longer available for pronoun binding) in cases of “reambiguation”:

(20) Die Absperrung des Rathauses wurde gestern von *The cordoning-off of the town hall was yesterday by* Demonstranten behindert. Wegen anhaltender Unruhen *protesters hampered. Due to continuing unrest,* wird sie heute aufrecht erhalten.
is it today sustained.

The cordoning-off of the town hall was hampered by protesters yesterday. Due to continuing unrest, it is sustained today.

“Lazy” approach to anaphora resolution

“Lazy” approach to anaphora resolution also makes wrong predictions:

- (21) * Die Absperrung wurde heute verstärkt. Sie war
The barrier was today fortified. It has
gestern behindert worden.
yesterday hampered been.

The barrier was fortified today. Yesterday, it has been hampered.

Underspecification

Sometimes, no disambiguation is possible at all, e.g. for “verschieben”/move:

- (22) Die Absperrung wurde verschoben.
The cordoning-off/barrier was moved.