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

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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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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))

\[
\begin{align*}
  z & \vdash \alpha = e \lor \alpha = s \lor \alpha = y \\
  Absperrung(\alpha) \\
  e & \text{ CAUSE } s \\
  s : & \text{ have}(y, z) \\
  \text{function} = & \text{ as } \text{ barrier}(y) \\
  \text{Agent}(e) = & x
\end{align*}
\]

- Sortal ambiguity of “Absperrung” at the NP-level: disjunction operator \( \lor \) (Reyle et al. (2007)).
- Disambiguation of \( \alpha \) 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.
Compositional derivation of “Ab-sperr-ung”
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.
(5) Die Absperrung des Rathauses wurde 
The cordonning-off of the town hall was 
vorgestern von Demonstranten behindert. 
the day before yesterday by protesters 
Wegen anhaltender Unruhen wird sie heute 
Due to continuing unrest, is 
aufrecht erhalten. 
sustained.

The cordonning-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)

- 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 cording-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 “reambiguated” 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?

Given “Absperrung” denotes a single object with complex type $\tau(Absperrung) := \text{event} \otimes \text{entity} \otimes \text{state}$, 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).
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.
Recall Hamm and Solstad (2010)’s DRS for “Absperrung”:

\[
\begin{align*}
z & \vdash \\
\alpha &= e \lor \alpha = s \lor \alpha = y \\
Absperrung(\alpha) & \\
e & \text{CAUSE } s \\
s & : \text{have}(y, z) \\
function & : \text{as} - \text{barrier}(y) \\
\text{Agent}(e) &= x
\end{align*}
\]
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
    
    \[
    \textit{function} \rightarrow \textit{as} \rightarrow \textit{barrier}(y)
    \]
  - “event”: conceptualized via causal relationships with other events/states
    
    \[
    e_0 : \textit{CAUSE}(e_1, s)
    \]
  - “state”: conceptualized via a combination of properties and causal relationships
    
    \[
    s : \textit{have}(y, z)
    \]
Underspecification of conceptualization I

- Break up the DRS into single “identification” conditions for $\alpha$.
- Arrange the “identification” conditions for $\alpha$ in an algebraic structure.
- Structural underspecification of identification and consequent ontological coinage of $\alpha$.

$\Rightarrow$ Selection restrictions (and the lexical semantics) of the container verb determine the structural and thus ontological specification of $\alpha$. 
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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Underspecification and ontological commitment
Selection restriction: thing

\[\text{(7) Template: } \text{verstaerken}(\alpha^{SR:\text{thing}}, \ldots) \text{ (fortify);}\]

\[l_4 \rightarrow l_1 \rightarrow l_0\]
Selection restriction: event

(8) Template: behindern($\alpha^{SR: event}$, ...) (hamper);

\[ l_4 \rightarrow l_3 \rightarrow l_2 \rightarrow l_1 \rightarrow l_0 \]

\[ l_0 : \text{Absperrung(}\alpha) \]

\[ l_1 : \text{function} \rightarrow \text{barrier(y)} \]

\[ l_2 : s : \text{have}(y, z) \]

\[ l_3 : e_0 : \text{CAUSE}(e_1, s) \]

SR:thing

SR:state

SR:event

\[ l_4 : e : \text{behindern}(\alpha^{SR: event}, \ldots) \]
Selection restriction: state, underspecified identification

(9) Template: \textit{aufrecht} \textit{− erhalten}(\alpha^{SR:state}, \ldots) (sustain);

\begin{align*}
  l_4 & \quad l_2 \quad l_0 \\
  l_1 & \quad l_0 \\
  l_3 & \quad l_0
\end{align*}

\begin{itemize}
  \item $l_0$ : \textit{Absperrung}(\alpha)
  \item $l_1$ : \textit{function} \textit{− barrier}(y)
  \item $l_2$ : \textit{s : have}(y, z)
  \item $l_3$ : \textit{e_0 : CAUSE}(e_1, s)
  \item $l_4$ : \textit{e : aufrecht} \textit{− erhalten}(\alpha^{SR:event}, \ldots)
\end{itemize}
Underspecified selection restriction

(10) Template: \textit{verschieben}(\alpha^{SR:\textit{thing};\textit{event}}, \ldots) (move);

\[ l_4 \leftarrow l_3 \leftarrow l_2 \leftarrow l_1 \leftarrow l_0 \]

\[ l_0 : \text{Absperrung}(\alpha) \]

\[ l_1 : \text{function} \rightarrow \text{barrier}(y) \]

\[ l_2 : s : \text{have}(y, z) \]

\[ l_3 : e_0 : \text{CAUSE}(e_1, s) \]

\[ l_4 : e : \text{verschieben}(\alpha^{SR:\textit{event};\textit{thing}}, \ldots) \]
Underspecified selection restriction, underspecified identification

(11) Template: `ignorieren(\alpha, \ldots)` (ignore);

\[
\begin{array}{c}
\text{SR:event} \\
\text{SR:state} \\
\text{SR:thing}
\end{array}
\]

\[
\begin{array}{c}
l_4 \\
l_2 \\
l_1 \\
l_0
\end{array}
\]

\[
\begin{array}{c}
l_3
\end{array}
\]

\[
\begin{array}{c}
l_0: Absperrung(\alpha)
\end{array}
\]

\[
\begin{array}{c}
l_1: function\neg\text{ barrier}(y)
\end{array}
\]

\[
\begin{array}{c}
l_2: s: have(y, z)
\end{array}
\]

\[
\begin{array}{c}
l_3: e_0: CAUSE(e_1, s)
\end{array}
\]

\[
\begin{array}{c}
l_4: e: ignorieren(\alpha, \ldots)
\end{array}
\]
Sortally ambiguous -ung Nominalizations

Two approaches to sortal ambiguity

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Underspecification and ontological commitment
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 $\alpha$.
The cordonning-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

\[ (13) \quad \text{behindern}(\alpha^{SR:\text{event}}, \ldots) \text{ (hamper)}; \]
\[ l_4 \to l_3 \to l_2 \to l_1 \to l_0 \]

\[ (14) \quad \text{aufrecht \textendash} \text{erhalten}(\alpha^{SR:\text{state}}, \ldots) \text{ (sustain)}; \]
\[ l_4 \to l_2 \xleftarrow{l_1 \to l_0} \]
\[ l_3 \to l_0 \]
Reidentification III

\[ l_0 : Absperrung(\alpha) \]

\[ l_1 : function \_ barrier(y) \]

\[ l_2 : s : have(y, z) \]

\[ l_3 : e_0 : CAUSE(e_1, s) \]

\[ l_4 : e : behindern(\alpha^{SR: event}, \ldots) \]
Preliminary DRS after the application of the template for “behindern” (hamper):

\[
\begin{align*}
\alpha, z, e, y, e_1, e_2, s \\
Absperrung(\alpha) \\
e \text{ CAUSE } s \\
s : have(y, z) \\
function = as = barrier(y) \\
e_1 : behindern(e_2, \ldots) \\
e_2 = e \\
e = \alpha
\end{align*}
\]
Reidentification I

$l_0 : Absperrung(\alpha)$

$l_1 : function \rightarrow barrier(y)$

$l_2 : s : have(y, z)$

$l_3 : e_0 : CAUSE(e_1, s)$

SR:thing

SR:state

SR:event

$l_4 : e : behindern(\alpha^{SR: event}, \ldots)$

$l_5 : s : aufrechterhalten(\alpha^{SR: state}, \ldots)$
DRS

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

\[
\begin{align*}
e, \alpha, s, y, e, e_0, e_2, z, s_0, s_1 \\
Absperrung(\alpha) \\
e \text{ CAUSE } s \\
s : \text{have}(y, z) \\
\text{function – as – barrier}(y) \\
e_0 : \text{behindern}(e_2, \ldots) \\
e_2 = e \\
e = \alpha \\
s_0 : \text{aufrecht – erhalten}(s_1, \ldots) \\
s_1 = s \\
s = \alpha
\end{align*}
\]
Reidentification: Blocking I

(17) * Die Absperrung des Rathauses wurde heute
    The cordonning-off the town hall was fortified
    verstärkt. Sie wurde gestern massiv behindert.
today. It was massively hampered yesterday.
Preliminary DRS after the application of the template for “verstaerken” (fortify).

\[
\begin{align*}
\alpha, y, e \\
Absperrung(\alpha) \\
function &- as - barrier(y) \\
e : verstarken(y) \\
y = \alpha
\end{align*}
\]

(18)
DRS

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

\[
\begin{align*}
&y, e, y_1, e_0, e_1, \alpha \\
&Absperrung(\alpha) \\
&function – as – barrier(y) \\
&e : verstarken(y_1) \\
&y_1 = y \\
&y = \alpha \\
&e_0 : behindern(e_1, \ldots) \\
&e_1 = ?
\end{align*}
\]

(19)

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


References III


References IV


Naive disambiguation: disjunct deletion

Naive approach to the disambiguation of “Absperrung”:

- Delete \( \neg \) disjuncts according to the selection restrictions of the container verb.

\[ \Rightarrow \] 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 Demonstranten behindert. Wegen anhaltender Unruhen Protesters hampered. Due to continuing unrest, wird sie heute aufrecht erhalten. is it today sustained.

The cordonning-off of the town hall was hampered by protesters yesterday. Due to continuing unrest, it is sustained today.
“Lazy” approach to anaphora resolution also makes wrong predictions:

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

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 cordonning-off/barrier was moved.