

Reambiguating: On the non-monotonicity of disambiguation

When representing e.g. scopal or lexical ambiguities by means of underspecification, one standard technique is to formalize the range of interpretations of an expression by means of disjunction (Reyle 1993) or conjunction (Poesio 1996). In the UDRT approach of Reyle, for instance, underspecification is represented by means of the disjunctive operator \downarrow , cf. the simplified representation of the two-way ambiguous deverbal nominalization *delivery* in (1):

(1)

$\alpha = e \downarrow \alpha = y$ $e: \text{deliver}(x,y)$ $\text{AGENT}(e)=x$ $\text{THEME}(e)=y$
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As indicated in the first line of the condition part of this representation, the referential argument α of a noun phrase headed by *delivery* may either be an event or an object, the latter corresponding to the theme of *deliver*.

Assuming a disjunct or conjunct representation of ambiguous expressions, disambiguation is often viewed as a process of disjunct or conjunct deletion. Thus, the disambiguating contexts for *delivery* in (2) are often thought to lead to a deletion of the first or second disjunct in the DRS condition in (1) (similar remarks may be made for Poesio's (1996) disambiguation inference mechanism).

- (2)
- a. the damaged delivery ($\alpha = e \downarrow \alpha = y$)
 - b. the delivery yesterday ($\alpha = e \downarrow \alpha = y$)

In this talk, we want to show that this view of disambiguation is not adequate, focussing on the fact that information deleted in the process of disambiguation is not recoverable if one assumes monotonicity of interpretation. In a broad case study of deverbal nominalizations, we will provide evidence from anaphora resolution that a deletion approach to disambiguation makes false predictions. We will argue that disambiguation should be allowed to be local and reversible, thus introducing mechanisms of what we will term *reambiguation*.

Our data will mainly involve German deverbal nominalizations, since in general these are ambiguous to a higher degree than their English counterparts. More specifically, we will present a study of nouns derived by means of the suffix *-ung* (comparable both to *-tion* and *-ing* nominalizations in English). While all productively derived *-ung* nouns have an event reading, quite a few *-ung* derivations additionally have state and/or object readings, cf. the examples in (3), involving *Absperrung* (from *absperren* 'cordon off'), which is three-way ambiguous:

- (3)
- a. *Die Absperrung wird morgen abgebaut.* (object interpretation only)
'The barrier will be dismantled tomorrow.'
 - b. *Die Absperrung des Gebiets wird noch aufrecht erhalten.* (state interpretation)
'The cordoning-off of the area is still sustained.'
 - c. *Die Absperrung des Gebiets wurde von den Demonstranten behindert.* (event interpretation only)
'The cordoning-off of the area was hampered by the protesters.'

All noun phrases headed by *Absperrung* in (3) are disambiguated in context: the predicate *abbauen* 'dismantle' (3a) is assumed to select for object interpretations, *aufrecht erhalten* 'sustain' (3b) for states and *behindern* 'hamper' (3c) for event interpretations. A simplified, underspecified semantic representation covering all three readings is provided in (4). Briefly stated, *Absperrung* involves an event e leading to a state s in which the (incremental) theme y blocks access to some region z . Again, the topmost condition of the representation provides information on the possible referential arguments of the noun: it may be an event (e), a state (s) or an object (y).

(4)

$\alpha = e \downarrow \alpha = s \downarrow \alpha = y$ $e \text{ CAUSE } s$ $s: \text{block}(y,z)$ $\text{AGENT}(e)=x$

Taking the above disambiguating contexts of *Absperrung* as a starting point, one can show that for anaphora resolution a naive deletion approach to disambiguation makes the wrong predictions of the sequence in (5):

- (5) *Die Absperrung des Rathauses wurde vorgestern von Demonstranten behindert. Wegen anhaltender Unruhen wird sie auch heute aufrecht erhalten.*
 ‘The cordoning-off of the town hall was disturbed by protesters the day before yesterday. Due to continuing unrest, it [the state of being cordoned off] is sustained today as well.’

In (5), the anaphora *sie* ‘it’ is clearly coreferential with the noun phrase headed by *Absperrung* in the first sentence. As just stated, the predicate *behindern* ‘hamper’ restricts the ambiguity of *Die Absperrung des Rathauses* and fixes an event reading of the noun phrase. However, the matrix predicate in the second sentence, *aufrecht erhalten* ‘sustain’, only allows the referential argument of the anaphora *sie* to be a state. But if the fixation of the event reading, i.e. the disambiguation of *Absperrung*, involves the irreversible deletion of its other possible referential arguments, there should be no appropriate discourse referent for *sie* to pick up, contrary to intuitions.

Let us briefly remark that a sloppy approach within centering theory (cf. e.g. Hardt 2003) does not seem to offer a straightforward solution, since center shifting is not available if the relevant discourse referent has been elided in the preceding context. Attempting to avoid the problem by assuming that disambiguation does not involve any deletion whatsoever is no option, as this would predict that every possible discourse referent of a noun is always available in subsequent sentences. The following example, which we cannot comment on, shows that this is not the case:

- (6) *#Die hölzerne Absperrung wurde heute grün angestrichen. Sie war am Vortag massiv behindert worden.*
 Intended reading: ‘The wooden barrier was painted green today. It (the cordoning-off) had been massively hampered the day before.’

In our solution to the above conflicting requirements in (5), we will allow disambiguation to be non-monotonic, assuming a process of *reambiguation*. Let us be slightly more formal, sketching our approach which consists of a coupling of DRT with Constraint Logic Programming as discussed in Hamm et al. (2006). In the following, we will leave out everything which is not directly related to the resolution of the anaphora *sie* in the example; for instance tense will be neglected completely. The fixation of an event reading of *Absperrung* in the first sentence is roughly formalized by the following condition (a so-called *integrity constraint* in the terminology of Hamm et al. 2006):

- (7) $\text{Happens}(e, t), \text{Happens}(\text{behinder}(e), t)$

Here e corresponds to the definition of the event type representing one reading of *Die Absperrung des Rathauses*.

On the other hand, the matrix predicate in the second sentence, *aufrecht erhalten* ‘sustain’, introduces a condition concerning states:

- (8) $\text{HoldsAt}(f, t)$

The state f (*fluent* f in the terminology of Hamm et al. 2006) is here taken to be the referent of the pronoun *sie*. This state is of a different ontological category than the event e . Since the discourse model computed by the condition for the first sentence does not contain states, anaphora resolution is blocked.

However, we will show that the canonical map in (9) provides a suitable discourse referent for *sie* in the second sentence, thereby smoothing the category mismatch:

- (9) $e \mapsto \text{Happens}[e, \hat{t}] = f$

The computation of the discourse model for both sentences will then show that under this assumption anaphora resolution is unproblematic. The crucial point is that a possible meaning for *Die Absperrung des Rathauses* which was erased by the verb of the first sentence can be recovered via the above map in order to provide an antecedent for the anaphora contained in the second sentence. Consequently, disambiguation may be viewed as a local process which may be reversed in later contexts.

References: Hamm, Kamp & v. Lambalgen (2006): “There is no opposition between formal and cognitive semantics”, *Theoretical Linguistics* 32(1): 1–40 • Hardt (2003): “Sloppy Identity, Binding, and Centering”, in Young & Zhou (eds.), *Proceedings of SALT 13*, Ithaca: CLC • Poesio (1996): “Semantic Ambiguity and Perceived Ambiguity”, in v. Deemter & Peters (eds.): *Semantic Ambiguity and Underspecification*. Stanford: CSLI, 159–201 • Reyle (1993): “Dealing with Ambiguities by Underspecification: Construction, Representation and Deduction”, *Journal of Semantics* 10(2): 123–179.