

Towards Dialogue Acts and Updates for Semantic Coordination

Staffan Larsson

Department of Philosophy, Linguistics
and Theory of Science
Gothenburg University, Sweden
sl@ling.gu.se

Jenny Myrendal

Department of Education,
Communication and Learning
Gothenburg University, Sweden
jenny.myrendal@gu.se

Abstract

This paper sketches a formal account of semantic coordination, combining parts of two dialogue act taxonomies related to semantic coordination and relating these to meaning updates on an abstract level.

1 Introduction

Semantic coordination is the process of interactively agreeing on the meanings of words and expressions, and (simultaneously) agreeing on which words are appropriate in a given context. Shared meanings are achieved by agents interactively coordinating their respective takes on those meanings (Larsson, 2008).

In this paper, we will sketch a general account of dialogue acts for semantic coordination in dialogue by (1) sketching a synthesis of two existing taxonomies of dialogue acts relating to semantic coordination and (2) relating these dialogue acts to different kinds of updates to (agents takes on) meanings.

2 Dialogue acts for Semantic Coordination

In this section, we will begin to synthesize two taxonomies for dialogue acts related to semantic coordination. While these taxonomies are designed for different settings (first language acquisition and online discussion forums), they nevertheless overlap in interesting ways. By combining and relating them, we hope to eventually provide a more comprehensive overview of the dialogue acts used in semantic coordination independently of setting and domain.

2.1 Dialogue acts for word meaning negotiation

In Myrendal (2015) and Myrendal (submitted), a taxonomy for dialogue acts involved in Word Meaning Negotiations (WMNs) in online discussion forum communication is presented. We here show only parts of the taxonomy. All examples are taken from Myrendal (2015).

Frequently, the question under discussion (QUD) in a WMN concerns whether a certain *trigger expression* T correctly describes a situation S under discussion (what may be called a *SUD* in analogy with QUD). However, in some cases there is no particular SUD, but meanings are negotiated more abstractly.

Explicification¹: Provides an explicit (partial or complete) definition of T . Myrendal (2015) distinguishes between two types of explicifications. **Generic explicifications** foreground the meaning potential of T ; a complete or partial definition D of T is provided, but D is not clearly derived from S . For example, Myrendal (2015) shows an example where a DP (Dialogue Participant) is asked to clarify the meaning of *sexism* and in response offers a definition: "That people are treated differently because of their gender."

By contrast, **specific explicifications** foreground conversational context; particular aspects of the SUD S are made explicit and presented as a (typically partial) definition of T . One example is taken from a discussion about whether or not piercing the ears of young children is morally acceptable, or if it constitutes (*child*) *abuse*: "Clearly ABUSE to pierce the ears of young children! [...] - you inflict pain upon the child and a physical change which the child herself has not chosen and which cannot be made undone."

¹The term explicification is borrowed from Ludlow (2014), but is adapted and elaborated in Myrendal (2015).

Specific explicifications can also be negative. In one discussion the trigger word *boozing* (Sw. *su-per*). This discussion is about a woman who is denied alcohol in a restaurant. The bartender refuses to serve the woman a second glass of wine when he notices that she is breastfeeding her baby at the table. The thread starter in this discussion describes the woman's behaviour as "boozing" which then receives the following response: "2 glasses of wine is not boozing and it is not dangerous to drink while breastfeeding."

Exemplification: Providing examples of what the trigger word can mean, or usually means. In a discussion about dietary habits, many DPs state that they prefer to include full fat products in their diet. One DP requests clarification about the meaning of the trigger word ("What counts as full fat?"). Another DP then exemplifies the meaning of the trigger word: "When it comes to dairy products ordinary full cream milk, the fattest cheese and regular double cream (...)"

Similar to (specific) explicifications, exemplification can be negative. In a discussion about fast food, a DP protests against another DP's claim that (all) food from McDonald's is *unhealthy* (*T*): "Hamburgers with lettuce and water is not especially unhealthy." (Note that in this case the discussion does not revolve around a particular SUD, but rather around a general claim.)

Contrast: A third way of contributing to a WMN sequence is to contrast *T* against another word *C*, thus indicating a difference in meaning as well as updating the meanings of both *T* and *C* with respect to some example situation or entity.

In a discussion about whether or not it is acceptable to flirt with a married person, after a while it becomes clear that the participant asking this question has a specific situation in mind. The person doing the alleged flirting has expressed strong feelings towards the married person, sending her many text messages and e-mails per week and also sending flowers to her workplace. At this point, one participant objects to the trigger word being used to describe the SUD, and contrasts the trigger word with other words taken to be more suitable descriptions of the situation: "This is pure and utter courtship/picking someone up/declaration of infatuation! This is not how you flirt... at least not how I flirt. This is clearly way way beyond flirting in my world." Here, the behavior is claimed to

go beyond "flirting" and to be more accurately described as "courtship", "picking someone up" or "declaration of infatuation".

2.2 Dialogue acts for first language acquisition

Clark and Wong (2002) provide a taxonomy of dialogue acts involved in first language acquisition. We will here describe a subset of this taxonomy. (Note that we will be using some terminology from Myrendal (2015) when describing these acts, even if this is not exactly how they are described in Clark and Wong (2002).)

Direct offers are utterances where speakers offer conventional terms or expressions, and nothing else; the primary function of the utterance is as an offer. Direct offers tend to be made using only a limited set of frames for presenting the term being offered. For example, "That's a pen", "That's called a dentist", "What is this? Chair.", "What's that called? Dancing".

There are also *indirect offers*, where speakers (adults) use their next utterance, whatever it is, to include the term that is simultaneously being offered as a correct form of a term in the addressee's (child's) utterance. We will here concern ourselves with one kind of indirect offer, namely *explicit* ones. In cases of **explicit replace**, a term or expression *C* is proposed as a replacement for *T*. An example from Clark and Wong (2002) is the following:

Naomi: Birdie birdie.

Mother: Not a birdie, a seal.

Here, "seal" (*C*) is offered as a replacement for "birdie" (*T*).

2.3 Towards a synthesis

A basic difference between WMN in online discussion forums (henceforth ODF) as described in (Myrendal, 2015) and first language acquisition (1LA) is that the latter setting typically requires a shared perceptually available situation, whereas ODF pretty much exclude this possibility. Deictic phrases (e.g. "that") in 1LA typically refer to aspects of the shared perceptual situation, whereas in ODF they typically refer to aspects of the situation under discussion, which is only available to DPs through verbal descriptions.

Also, in ODF speakers are assumed to be competent, so attempts at unprovoked teaching of

words (which is frequent in 1LA) are not motivated. Furthermore, ODF interaction is written whereas adult-child dialogues are spoken and arguably more interactive. Despite these differences, we believe it may be interesting to also briefly note some similarities between the respective dialogue act taxonomies for ODF and 1LA.

Firstly, Clark and Wong’s **explicit replace** (“that’s not an X, that’s a Y”) is very similar to Myrendal’s **contrast**, but where the example is provided by the jointly perceived situation rather than by a verbal description. Secondly, Clark and Wong’s **direct offer** is similar to Myrendal’s (positive) **specific explicification**, where again the the jointly perceived situation provides the SUD.

For our current purposes, we will simply assume that direct offers can be treated as exemplifications and that explicit replace can be treated (more or less) as contrast. Importantly, doing so requires allowing for jointly observable situations (potentially including subsymbolic information derived from the sensory apparatuses of agents) to serve as the basis for the updates involved in both exemplification and contrast.

3 Meaning representations and updates

A full account of semantic updates involved in WMNs would require capturing the sequential updates at various stages of the negotiation process. Our goals here are more modest, in that we will not consider sequential updates or rejected proposals, but only try to capture isolated updates for *accepted* dialogue acts.

The exact way in which meaning updates are formalised will depend on how meanings are represented. Marconi (1997) distinguishes between inferential meanings of words, which enables to draw inferences from uses of the word, and referential meaning, allowing speakers to identify the objects and situations referred to by the word. We will regard inferential meaning as high-level (symbolic) rules governing inference, e.g. meaning postulates in modal logic or record types (and associated functions) in TTR (Larsson and Cooper, 2009). Secondly, referential meaning may be represented at least in part as low-level (subsymbolic) statistical or neural classifiers of perceptual data (Harnad, 1990; Steels and Belpaeme, 2005; Larsson, 2013; Kennington and Schlangen, 2015). A key insight here is that the step from perception to language can be conceptualised and im-

plemented as the application of a classifier to perceptual data, yielding linguistically relevant classification results as output.

Correspondingly, we may distinguish kinds of meaning updates. High-level structures can be modified e.g. by adding and retracting meaning postulates or “possible languages” (Barker, 2002), or by adding and removing fields in record types representing inferential meanings (Larsson and Cooper, 2009). Low-level aspects of meanings, modeled as classifiers, can be modified by retraining the classifier with new (positive or negative) data.

However, there are also intermediate cases. For example, as shown in the account of vagueness involving comparison classes (Fernández and Larsson, 2014), meanings may involve both high-level (e.g. comparison class for vague terms) and low-level information (e.g. perceived height). Similarly, meaning updates may concern both high-level and low-level information (e.g. perceived height).

We will adopt a fairly abstract formalism for conceptual updates, where we assume that either a full or partial (verbal and hence symbolic/high-level) definition D of the trigger word T has been provided, or alternatively an example situation or entity² E (represented using high or low level information, or a combination thereof). D or E is then used for updating the meaning in question.

- $\delta^+(T, D)$: T updated with D as a partial definition of T
- $\delta^-(T, D)$: T updated with D as a negative partial definition of T
- $\epsilon^+(T, E)$: T updated with E as a positive example of a situation described by T
- $\epsilon^-(T, E)$: T updated with E as a negative example of a situation described by T

These abstract update operations can then be further specified depending on the semantic formalism used. The abstract meaning update functions thus serve as a sort of API between dialogue acts and their consequent meaning updates. The existence and usefulness of this level of representation remains to be demonstrated in future work; here, we are simply aiming to formulate our account as clearly as possible.

Although it is not explicit in the formalism used here, semantic updates always concern a particular

²Insofar as entities can be reified as situations involving them, we need only to talk about example situations.

agent’s take on the meaning of the word in question. Meanings become shared by being interactively coordinated. Also, the viability of a semantic update may be limited to a specific dialogue, or it may eventually spread over a community and become part of “the language” (Larsson, 2008).

4 Meaning updates for dialogue acts

In this section, we present an initial characterisation of explicification, exemplification (including direct offers) and contrast (including explicit replace) in terms of the meaning updates described in the previous section.

Note that we are here formalising the update effect of successful (i.e. accepted) meaning updates. In general, proposed updates may not be accepted immediately but can lead to negotiation that may end up with coordinating on proposed update, no update or modified update. Formalising such exchanges is left for future work.

We will sidestep the problem of interpreting verbal definitions by simply using [square brackets] to indicate meanings of linguistic expressions. Updated meanings are indicated by a prime (’).

Explicification: By definition, explicifications provide a (full or partial) definition D of T , and the update is thus symbolic (linguistic) in nature which means that only the δ function is needed here.

As mentioned above, in the case of specific explicifications, the definition D is derived by abstraction over the (verbally described) SUD S .

- Generic explicification
 - Update: $T' = D$ (full) or $T' = \delta^+(T, D)$ (partial)
 - Example: $\llbracket \text{sexism} \rrbracket' = \llbracket \text{that people are treated differently because of their gender} \rrbracket$
- Specific explicification ($S \sqsubseteq D$)
 - Positive update: $T' = \delta^+(T, D)$
 - Example: $\llbracket \text{child abuse} \rrbracket' = \delta^+(\llbracket \text{child abuse} \rrbracket, \llbracket \text{to inflict pain upon the child and a physical change which the child herself has not chosen and which cannot be made undone} \rrbracket)$
 - Negative update: $T' = \delta^-(T, D)$
 - Example: $\llbracket \text{boozing} \rrbracket' = \delta^-(\llbracket \text{boozing} \rrbracket, \llbracket (\text{drinking}) 2 \text{ glasses of wine (or less)} \rrbracket)$

Exemplifying Proposes an example E of a situation or entity appropriately (or not, in the case of negative exemplification) described by T . The example can either be given verbally or it can be relevant aspects of the jointly perceived situation (often indicated by a deictic reference (“that”)).

- Update: $T' = \epsilon^+(T, E)$ or $T' = \epsilon^-(T, E)$
- Example: $\llbracket \text{full fat} \rrbracket' = \epsilon^+(\llbracket \text{full fat} \rrbracket, \llbracket \text{full cream milk} \rrbracket)$
- Example: $\llbracket \text{pen} \rrbracket' = \epsilon^+(\llbracket \text{pen} \rrbracket, S)$ where S is a jointly perceivable situation.
- Example: $\llbracket \text{unhealthy} \rrbracket' = \epsilon^-(\llbracket \text{unhealthy} \rrbracket, \llbracket \text{hamburgers with lettuce and water} \rrbracket)$

The last example above shows that the meanings negotiated may sometimes be specific to a domain (here, fast food).

Contrast: Proposes contrasting word C as an appropriate description of an example entity or situation E (as in positive exemplification), and trigger word T as inappropriate (as in negative exemplification).

- Updates: $T' = \epsilon^-(T, E)$, $C' = \epsilon^+(C, E)$
- Example:
 - $\llbracket \text{flirting} \rrbracket' = \epsilon^-(\llbracket \text{flirting} \rrbracket, E)$
 - $\llbracket \text{courtship} \rrbracket' = \epsilon^+(\llbracket \text{courtship} \rrbracket, E)$,
 - where $E = \llbracket \text{involves expressing strong feelings, sending many texts and emails, and sending flowers to the workplace} \rrbracket$.
- Example:
 - $\llbracket \text{birdie} \rrbracket' = \epsilon^-(\llbracket \text{birdie} \rrbracket, E)$,
 - $\llbracket \text{seal} \rrbracket' = \epsilon^+(\llbracket \text{seal} \rrbracket, E)$,
 - where E is the jointly perceived (by Naomi and Mother) SUD in the example in Section 2.2.

5 Conclusion

We have sketched a formal account of semantic coordination, combining parts of two dialogue act taxonomies and relating these to meaning updates on an abstract level. In future work, we will increase the coverage of the taxonomy, verify and if necessary extend the range of meaning update functions, and show how the meaning update functions can be specified in TTR.

References

- C. Barker. 2002. The Dynamics of Vagueness. *Linguistics and Philosophy*, 25(1):1–36.
- Eve V. Clark and Andrew D. W. Wong. 2002. Pragmatic directions about language use: Offers of words and relations. *Language in Society*, 31:181–212.
- Raquel Fernández and Staffan Larsson. 2014. Vagueness and learning: A type-theoretic approach. In *Proceedings of the 3rd Joint Conference on Lexical and Computational Semantics (*SEM 2014)*.
- Stevan Harnad. 1990. The symbol grounding problem. *Physica D: Nonlinear Phenomena*, 42(1990):335–346.
- Casey Kennington and David Schlangen. 2015. Simple learning and compositional application of perceptually grounded word meanings for incremental reference resolution. In *Proceedings of the Conference for the Association for Computational Linguistics (ACL)*, pages 292–301.
- Staffan Larsson and Robin Cooper. 2009. Towards a formal view of corrective feedback. In A Alishahi, T Poibeau, and A Villavicencio, editors, *Proceedings of the Workshop on Cognitive Aspects of Computational Language Acquisition, EACL*, pages 1–9.
- Staffan Larsson. 2008. Formalizing the dynamics of semantic systems in dialogue. In Robin Cooper and Ruth Kempson, editors, *Language in flux - dialogue coordination, language variation, change and evolution*. College Publications, London.
- Staffan Larsson. 2013. Formal semantics for perceptual classification. *Journal of Logic and Computation*, 25(2):335–369. Published online 2013-12-18.
- Peter Ludlow. 2014. *Living Words: Meaning Underdetermination and the Dynamic Lexicon*. Oxford University Press.
- Diego Marconi. 1997. *Lexical competence*. MIT press.
- Jenny Myrendal. 2015. *Word Meaning Negotiation in Online Discussion Forum Communication*. Ph.D. thesis, University of Gothenburg.
- Jenny Myrendal. submitted. Negotiating meanings online: disagreements about word meaning in discussion forum communication.
- Luc Steels and Tony Belpaeme. 2005. Coordinating perceptually grounded categories through language: A case study for colour. *Behavioral and Brain Sciences*, 28(4):469–89, August. Target Paper, discussion 489-529.