

# The Challenge of Argumentative Discourse: integrating revision updates in a text grammar formalism

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Since the development in the past decades of what might be called the ‘dynamic semantic paradigm’, see [4], it has become part and parcel of our thinking about discourse interpretation that the meaning of an utterance is characterised by the update, or change it brings about in its context of interpretation. The context of interpretation might variously be a common ground, an abstract information state, or a set of possible worlds restricted by what has been said so far in the conversation. This perspective recognizes meaning as an essentially context-dependent notion, but also implies a move towards *reasoning* as the central tool of our interpretational machinery. The meaning of an utterance is identified by reasoning about the consequences of accepting its content, given what we know, or are willing to accommodate, about the world, the utterance situation, and the public commitments<sup>1</sup> and private intentions of the participants.

Much of the linguistic work framed in terms of the dynamic perspective concerns forms of assertion whose semantics can be described in terms of purely additive or monotonic updates. In this talk, however, we focus on argumentative discourse contributions such as denial, counterevidence, objection, and concession, whose meaning, as we will claim, is more accurately captured in terms of revisional updates. The discourse in (1) illustrates this.

- (1) *Amy*: Our train leaves at four. (assertion)  
    *Ben*: No, at five past. (denial)  
    *Amy*: Well, it says so on the screen overthere. (counterevidence)  
    *Ben*: Oh, I guess you’re right then. (concession)

Reasoning about the meaning of the last three contributions crucially involves the critical evaluation and potential rejection of information accepted or under discussion in the context of interpretation. For instance, even if Amy is not going to accept Ben’s denial, comprehending his utterance as a denial implies she must find out that what he intends to convey is that the train is leaving at five past *instead of* four o’clock. World knowledge tells her that a train cannot leave both at four o’clock and at five past, so accepting the denial would imply rejecting her own preceding claim, cf. [1, 5].

Amy’s reply is at the same time a counterargument to Ben’s claim and evidence in favour of her own. Given common knowledge which says that if a screen with up-to-date information announces that a train leaves at four, it most probably does so, accepting this information may lead to the acceptance of Amy’s previous claim and the rejection of Ben’s denial. In addition, in the domain of dialogue strategies, the assumption that a conversation participant will not implicitly reject a claim she herself put forward previously is extremely important in getting at the intended meaning of Amy’s reply. Amy is *defending* her own previous claim - this is what resolves the elliptic ‘it says so’ in her utterance.

Finally, comprehending Ben’s last utterance as a concession crucially involves finding out that he is now giving up or *retracting* the claim he previously sup-

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<sup>1</sup>In the wake of Hamblin (1971) we view commitments as ‘as-if beliefs’, or ‘publicised beliefs’, generated and possibly retracted as a result of the communication process.

ported (namely that the train leaves at five past four), and does so because he accepts the counterargument provided by Amy.

Applying insights from belief revision theory [2], the interpretation of argumentative discourse contributions can be modeled directly by means of an update semantics whose basic update operation is nonmonotonic ‘revision’ rather than monotonic ‘merge’. A proposal to this effect was made in [5], which employs finegrained compositional DRT [7] to represent contexts of interpretation.

In this talk we build on the theory presented in [5], but our focus will be on those interactions that result from linguistic and discourse grammatical constraints on the one hand and the semantic and logical constraints given by belief revision theory on the other. A well-known property of revision updating is its nondeterminicity: a context set can generally be updated in more than one way to satisfy the revision task. Thus, belief revision theory predicts that argumentative contributions systematically result in underspecified meanings in a manner in which purely additive ones do not. Intuitively speaking, however, this prediction is not born out: even though the meanings of argumentative contributions can be underspecified, they don’t seem to be ‘more’ undeterministic than information providing contributions, and pinpointing their most preferred interpretation does not cause a higher processing load.

An obvious hypothesis is that in discourse interpretation, linguistic and discourse theoretical factors delimit the information that is open to revision, reducing underspecification to the extent that there is no essential difference between argumentative and nonargumentative contributions. If revision applies only locally in a discourse structure perhaps the ‘deep reasoning’ about contextual information can be avoided.

We find a platform for testing this hypothesis in Logical Description Grammar, a formalism for the specification of linguistic theory developed by Muskens and extended to cover discourse analysis in [6, 7]. LDG is similar to text grammar systems like LTAG for discourse (Webber c.s.) and the Linguistic Discourse Model (Polanyi) in that it presupposes that discourse representations are tree structures, but differs in that it adds a level of descriptions. In the course of a conversation, a hearer incrementally constructs a discourse *description*, a set of statements constraining the syntactic, semantic, and pragmatic properties of the discourse. Interpretation is a *reasoning* task, in which the hearer infers what tree structures may verify the discourse description given his grammatical knowledge and preferences, and his nonlinguistic knowledge and beliefs.

In order to cope with divergencies between participants’ commitments arising from the incrementality of the interpretation process and from argumentative contributions, we extend the LDG formalism so that each node in a described tree carries separate semantic values for each participant. Discourse descriptions specify conditions on node ownership, which affect the composition and content of semantic values for each participant. This implements a basic form of cross-speaker ‘grounding’ of discourse contributions<sup>2</sup> and allows us to define *dialogue meaning* as the set of individual participants’ commitment slates, inferable for any verifying model of the discourse description.

Two essentially different approaches may be pursued to integrate revision

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<sup>2</sup>See e.g.[8] for a full-fledged treatment of grounding.

updates in the text grammar formalism. One is to import e.g. ‘revisional compositional DRT’, as specified in [5], directly in the description language and let the basic update operation at any node in the discourse tree be ‘revision’ rather than merge. Revision is an operation at object level in the language. The other is to try and make use of means already available the description language in such a way that the update effect of argumentative discourse contributions on the output commitment slates of the relevant participants is revisional. That is, in going from one state of the discourse description to the next, commitments are lost or replaced. The proposal in [5] then only models the update effect at metalevel.

In line with [3] we opt for the second approach and use conventional means such as importing semantic values in the scope of nonveridical connectives or discourse relations via discourse attachment. Moreover, we may ‘walk the discourse structure’, either to retrieve values that must be saved from inscoping, or to decide whether contextual information is to be accepted or not by a participant given the contribution just made.

An implementation of this kind lays bare linguistic constraints on the revision process. Interaction with parameters such as anaphora resolution and information structure constrain underdeterminism in that they help to pinpoint the initial culprit information which is to be retracted. The subsequent update effect on the publicised contextual information is in general still underspecified, however. The same goes for the effect on the participants’ private knowledge and beliefs. The intentions of participants in saying what they say, their support and justification of what they commit to, their level of confidence in their own and other’s beliefs must be taken into account if we want to explain why one possible revision track is preferred over another. Thus, where the interaction with *nonlinguistic* knowledge and beliefs in the interpretation process is concerned, the ‘deep reasoning’ of belief revision theory cannot be avoided.

## References

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