

Conversational gameboard and discourse structure

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This paper tries to bring closer two theories of human communication:

Commitment stores and dialogue games

Hamblin (Hamblin, 1970) introduced the notion of *commitments stores* whereby dialogue participants can keep track of (public) commitments that arise during the interaction. He also pointed out the rule-governed nature of dialogues, and tried to exhibit set of normative rules (*dialogue games*) which could prevent certain types of fallacies

Discourse semantics The primary aim of this approach was to extend Montagovian compositional semantics to account for phenomena observed at the discourse level. This motivated a shift from static truth-semantics to an update semantics (that is, sentences are regarded as update functions on possible worlds). In this perspective, the semantic/pragmatic interface becomes the focus of attention.

The case for a crossover. To begin with, one may ask why dialectical models are not enough to model human conversations. Very often, a turn is composed of several basic units. Under the assumption that the speaker obeys coherence principles (e.g. the so-called "right frontier" of discourse structure (Asher and Lascarides, 2003)), it is for instance possible to define those discourse referents that can be used later in the dialogue. This, of course, can prove to be crucial when facing the interpretation of follow-up utterances and dialogue turns. It is clear that current dialectical approaches fall short of being able to account for

these aspects, as they are simply not equipped with notions allowing to deal with this level of analysis. On the other hand, the very same observations can be made at the level of dialogue turns, thus emphasizing the need to take into account dialogue structure.

Semantic content, speech acts and rhetorical relations

We take speech acts as conversational basic units, consisting of a propositional content and an illocutionary force. Following proposals in SDRT (Asher and Lascarides, 2003), semantic content is represented as Discourse Representation Structure (Kamp and Reyle, 1993) (K_π), and augmented by specifying the producer (L_π) and the mood (affirmative, interrogative, imperative) (M_π) of the utterance. In SDRT, assuming the coherence of a discourse means that each utterance has to be related to the context with a rhetorical relation (except the first one). Such relations are defined by their triggering conditions and their semantic effects. In discursive approaches, coherence is verified if an utterance can be successfully attached to the context. Likewise, coherence in conventional approaches of dialogue corresponds to the successful integration of a dialogue act in an authorized dialogue game.

We use the discourse structure definition presented in (Asher and Lascarides, 2003)(section 4.4.1). $DS = \langle A, \mathcal{F}, LAST \rangle$ where A is a set of labels, \mathcal{F} is an assignation function from labels to well-formed SDRSs, and $LAST$ is the last discourse label introduced. A well-

formed SDRS is either (i) a logical form for atomic natural language clauses (like DRs), (ii) a discourse relation between labels, (iii) the dynamic conjunction of two well-formed SDRs or finally (iv) the negation of a SDRS.

A *Conversational scoreboard* consists of the discourse structure (\mathcal{DS}) and commitment stores (\mathcal{E}_A and \mathcal{E}_B) of speakers A and B over certain elements of \mathcal{DS} : $\mathcal{CS} = \langle \mathcal{DS}, \mathcal{E}_A, \mathcal{E}_B \rangle$. Elements of \mathcal{E}_X are SDRS contents, i.e. either simple DRs, or complex constituents. Some of these contents received a negative polarity if speakers are committed to their falsity (linked to an expressed disagreement; this has nothing to do with private beliefs, but reflects public information).

We consider here how commitment evolves, and how this can be seen as an interpretation of coherence relations in a dialogue, whether we consider "monologic" relations¹ or properly dialogic relations. The following rules can thus be seen as update rules of the board for each recognized act for which a relation with the context can be inferred. The first case to consider is for monologic vericonditional relations, i.e. relations whose dynamic semantic is of the form (\wedge_{dyn} is dynamic conjunction) as proposed in (Asher and Lascarides, 2003):

$$(w, f) \llbracket R(\pi_1, \pi_2) \rrbracket_M(w', g) \text{ ssi } (w, f) \llbracket \mathcal{F}(\pi_1) \wedge_{dyn} \mathcal{F}(\pi_2) \wedge_{dyn} \phi_{R(\pi_1, \pi_2)} \rrbracket_M(w', g)$$

Here ϕ stands for semantic effects due to each relation (e.g. *narration*(π_1, π_2) implies a temporal succession of events in π_1 and π_2 , and a common topic for the pair). In a dialogue context, the producer of π_1 and π_2 is then committed to the content of π_1 and π_2 , and the rhetorical link between them, because semantic effects can be seen as conventionally implied.

We note \Rightarrow_π the update of commitment stores by a constituent π . If both π_1 and π_2 are produced by the same speaker, her commitment store will evolve as follows (in two steps):

¹"Monologic relations" have to be understood as relations that were already studied in the monologue case even if they hold also across speech turns.

$$\mathcal{E}_A \Rightarrow_{\pi_1} \mathcal{E}_A \cup \{\mathcal{F}(\pi_1)\} = \mathcal{E}_{A'} \Rightarrow_{\pi_2} \mathcal{E}_{A'} \cup \{\mathcal{F}(\pi_2), \phi_{narration(\pi_1, \pi_2)}\}$$

The remaining of the board is left unchanged. If it is a "monologic" relation across speech turns (π_1 is said by A, and π_2 by B), then only the first update applies to A, while both updates apply to B's commitment store. Likewise, other relations can be interpreted as commitment updates, with "truth" replaced by the corresponding commitment of a speaker to a proposition.

Given that speaker B utters π_2 , and that π_2 is to be attached to π_1 with the relation R we define commitments for dialogic relations in the following way :

- if $R = relation_q$ (i.e. $relation_q(\pi_1, \pi_2)$ holds)² then B's commitments are not affected but *relation* defines the commitments concerning the answer to the question (see next case)

- if $R = QAP$ (Question Answer Pair) then B commits himself to the answer and to the link between the context and the question-answer pair. If $Relation_q(\pi_0, \pi_1)$ then

$$\mathcal{E}_B \Rightarrow \mathcal{E}_B \cup \{\mathcal{F}(\pi), \phi_{Relation(\pi_0, \pi)}\} \text{ where } \pi \text{ corresponds to the resolved question-answer pair.}$$

- if $R = acknowledgement$, then B commits herself to π_1 content.³ $\mathcal{E}_B \Rightarrow \mathcal{E}_B \cup \{\mathcal{F}(\pi_1)\}$

- if $R = challenge$ (as defined in (MacKenzie, 1979)) A cannot go further without either withdrawing or justifying the proposition. $\mathcal{E}_A \Rightarrow \mathcal{E}_A \cup \mathcal{F}(\pi_1)$ and $\mathcal{E}_B \Rightarrow \mathcal{E}_B \setminus \mathcal{F}(\pi_1)$

References

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²These relations are interrogative content relation (e.g. *elaboration*, *narration*). The constituent associated with the question answer pair will be attached to the context through the corresponding "monologic" relation.

³Acknowledgement is more complex when communication is not taken as "perfect".