Frames in discourse

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The way of distributing information is one of the core aspects in the interaction of sentence structure and interpretation: the information structure of the sentence. The goal of this talk is to present a model of discourse processes and related concepts of information structure. The proposed model builds upon the basic assumptions of a frame-based representation of semantic and conceptual knowledge based on Kallmeyer & Osswald (2013), Petersen (2015) and Löbner (2017).

Information structure concerns the way communicating agents organize information within a discourse. In verbal communication, context and grammatical form determine the informational content of an utterance together. Natural languages provide various formal means to signal what the essential contribution of an utterance is to the shared knowledge of the interlocutors, generally referred to as the Common Ground [CG] (Stalnaker, 2002; Krifka & Musan, 2012). The CG is a constantly changing abstract object, updated by each step in the discourse. In a broad sense, information structure is defined in terms of information packaging (Chafe, 1976) and its basic categories: the ways how information is transferred between the interlocutors. Under this broad understanding, general cognitive categories are defined that reflect the interface between the mental representations (information states) as conceptualization of the CG and the universe of the discourse. Such cognitive categories are givenness and aboutness that are often considered as primitives.

Modeling concepts of information structure constitutes a modeling of communication acts and discourse processes where referential structure and information update are of central importance. This calls for a cognitively plausible framework. Frame semantics builds upon the hypothesis that the human cognitive system works with a uniform format of representation that is argued to be a frame format (Löbner 2015; following Barsalou, 1992, Barsalou & Hale, 1993).

In my talk, I will introduce a first proposal of a discourse-model using frame-semantic representations. Content words evoke concepts (represented as frame structures), while function words lead to special operations on or structuring of these concepts. The proposed model is built upon the formal definition of frames as base-labelled typed feature structures following Kallmeyer & Osswald (2013). The discourse universe is built upon a sequence of utterances, where each utterance is represented in terms of discourse objects, formally defined as an ordered set of discourse referents and a frame (Fig.1), where the discourse referents are all linked to base-labelled nodes in the corresponding frame. This linking is represented by cross-labelling. The determiners (articles) in the noun phrases play a crucial role in marking whether a discourse referent is newly introduced or it is an old (or anaphoric) one. The basic definite-indefinite distinction1 can be captured by representing the discourse objects as ordered triples where the first set contains the newly introduced referents and the second set contains the anaphoric/old referents.

1 For the current proposal, we keep the simple distinction of definite and indefinite NPs as corresponding to old and new referents respectively, however, a more fine-grained representation of different levels of givenness is required and is under investigation (to model, e.g., the rich article system in Lakota).
Abstracts

This representation shares important basic insights with the corresponding DRT representation of the sentence, however, as I will argue, a frame-based characterization of the conditions of the referents has various advantages (for example, for bridging anaphora and situational anaphora).

The sentence-level representation \( \langle \mathcal{N}, \mathcal{A}, F_s \rangle \) registers the newly introduced referents \( \mathcal{N} \), the anaphoric referents \( \mathcal{A} \) and the content of the sentence as a frame \( F_s \). The immediate discourse context is formally defined as a pair of discourse referents already introduced and a frame representation of the information given at that point of the discourse: \( \langle \mathcal{R}, F_c \rangle \). Updating the context with an utterance is defined in terms of union on the sets of referents and unification of frame structures: \( \langle \mathcal{R}, F_c \rangle [\langle \mathcal{N}, \mathcal{A}, F_s \rangle] = \langle \mathcal{R} \cup \mathcal{N}, F_c \cup F_s \rangle \). Anaphora resolution is captured by the constraint stating that for all referents \( r \in \mathcal{A} \) the corresponding base-labelled node \( n \) in the frame \( F_s \) in the sentence-frame must be unified with a base labelled node \( m \) in the context-frame \( F_c \) \( F_c \cup F_s \) under \( n = m \).

\( s_1 \): A girl slapped a man. \( s_2 \): She smiled.

\[ c_1 = c_0[s_1] = \langle \emptyset, F_{c0}[\langle \{d^e, d^x, d^y\}, \emptyset, F_{s1}\rangle] = \langle \{d^e, d^x, d^y\}, AG \rightarrow PAT \rangle \]

\[ c_2 = c_1[s_2] = \langle \{d^e, d^x, d^y\}, \rangle[\langle \{d^e\}, \{d^f\}, \text{slap}, person, female \rangle = \]

\[ c_2 = \langle \{d^e, d^x, d^y, d^z\}, \rangle \]

Aboutness topic is represented both at the sentence-level and in the immediate discourse context as a distinguished element in the set of referents. In my talk, I will discuss in detail the modeling of the effects of topic selection to anaphora resolution and
other discourse processes. In modeling the CG, a core distinction is made between the immediate common ground [ICG] and the general common ground [GCG] (Krifka & Musan, 2012). The ICG or local discourse context is represented in a way that the central component is the result of the update by the each sentence, and the other component registers the sentence level contribution of the utterances and their coherence relations. These relations play an important role in interpretation. The two phenomena where these relations are particularly influential are anaphora resolution and disambiguating focus structure. The architecture of the model of the ICG includes a level of representation of coherence relations. The GCG is defined as a set of constraints that reflect world knowledge and certain conventional meanings.


