On the Cognitive and Text-Analytic Status of Coherence Relations

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1. Coherence relations

A discourse is more than a random set of sentences, because it is coherent (e.g. Hobbs, 1990) Discourse coheres –among other things– because coherence relations hold between the segments, or rather between the representation people make of the segments. A coherence relation is an aspect of the meaning of two or more discourse segments that cannot be described in terms of the meaning of the segments in isolation. In other words: it is because of this coherence relation that the meaning of two discourse segments is more than the sum of the parts.

2. Two central issues: descriptive adequacy and psychological plausibility

Coherence relations (or similar concepts like discourse structure relations, rhetorical relations, rhetorical predicates etc.) play a key role in interdisciplinary research on discourse. For example, in text analysis (Mann & Thompson, 1988) and psychological research on text understanding (e.g. Meyer, 1985; Van Dijk & Kintsch, 1983) coherence relations occur as descriptive tools to analyze natural texts and as important components of text structure that affect text understanding. Coherence relations also figure in computational linguistic research, where they are used as a tool to construct or interpret coherent discourse (see e.g. Hovy, 1988, 1990).

However, in all three fields there is much discussion about both the exact status of the relations and about the amount of relations needed. For example, Mann and Thompson present a set of 23 or so relations, without any further ordering. From a computational point-of-view this has appeared to be unattractive (Hovy, 1990).

In my opinion, two issues central to the discussion should be distinguished: 1) the cognitive status and 2) the text-analytic status of the relations. The first concerns the psychological plausibility of coherence relations: what is their role in the construction of a cognitive representation by writers and readers? The second concerns descriptive adequacy: their role as a useful tool to describe text

structure. Both issues are addressed in this paper.

3. Toward a parsimonious theory of coherence relations

First, I want to explore the status of coherence relations as cognitive entities. Coherence relations seem a suitable starting point for a theory of discourse structure that aims at describing the link between the structure of a discourse as a linguistic object and its mental representation. Such a theory should at least generate plausible hypotheses on the role of discourse structure in the construction of the cognitive representation. The problem with existing analytic proposals is that they do not allow for such hypotheses. For example, it might be assumed that readers understand a discourse in which clauses are linked by a Claim-Argument relation because notions like Claim and Argument are cognitive primitives. This is problematic because the lists of relations presented in the literature are often unorganized and may well be infinite. Consequently, it is not clear how many primitives must be assumed – if there is a limit to this number at all.

By contrast, I aim at a parsimonious theory of coherence relations. To that end, we have developed a taxonomy that organizes the set of relations (Sanders, Spooren & Noordman, 1992, 1993). A relation like Claim-Argument is taken to be composite: It can be analyzed in terms of a limited set of cognitive primitives, like causality. These primitives are taken to be cognitively basic and apply also to other coherence relations. It is hypothe- sized that readers use their knowledge of these basic concepts to infer the coherence relations. Therefore, the set of relations is classified in terms of four primitives that apply to all relations: Basic Operation (causal or additive), Source of Coherence (semantic or pragmatic), Polarity (positive or negative), Basic order (basic or non-basic) (see Sanders et. al. 1992, 1993).

In order to test this classification, four experiments were carried out in which sentence pairs connected by coherence relations were presented to subjects. The experimental items were prototypical examples of the relations in the taxonomy. In two experiments, subjects categorized experimental items on the basis of the relation connecting the sentence pairs, in a third they labelled the relations and in a fourth they were asked to connect segments by means of a connective. In general, the results indicate that the 12 classes distinguished in the taxonomy are intuitively plausible and applicable and that the primitives underlying the taxonomy are psychologically salient.

4. The cognitive status of coherence relations: their role in text processing

Does any experimental evidence exist for the claim that coherence relations are cognitive entities? It can be concluded from a review of experimental literature on the relation between text structure and text processing that two findings are relevant: 1) different text structures lead to differences in text understanding and 2) linguistic marking of text structure influences text processing.

In an attempt to overcome some of the difficulties found in the overview, a reading experiment was conducted, in which two aspects of the structure of expository texts were manipulated: The type of coherence relation between two segments (Problem-Solution versus List) and the linguistic marking of these relations (implicit versus explicit) (Sanders, 1992, chapter 4). Reading times per sentence were collected, subjects verified statements with regard to the text and they were given a free recall task. Both factors appeared to influence text processing. Problem-Solution relations lead to faster processing, better verification and more reproduced information. Explicit marking of the relations resulted in faster processing, but did not affect verification, nor the amount of reproduced

information.

These results show that the processing of a text segment depends on the relation it has with a preceding segment. Although the results should still be interpreted with some care, they suggest that the role of the relational marker is restricted to text processing; contrary to the coherence relation, which is an indissoluble part of the representation, the linguistic marking does not affect the recall of the information.

5. The text-analytic status of coherence relations

How about the text-analytic status of the relations? The taxonomy sketched above does not pretend to be a complete descriptive tool for the analysis of discourse structure. The categorizing principles concerned the relation between the segments, and not the meaning of the segments themselves. However, the classes of relations generated by the taxonomy can be further specified with seven segment-specific criteria to arrive at a descriptively adequate set such as Mann & Thompson's (1988) (Sanders, 1992, chapter 6). Examples of these criteria are Volitionality, Specificity and Temporal Order.

Clearly, not all analytical problems are solved with such a descriptively adequate set. One crucial issue for further research is the hierarchical structure of discourse (Sanders 1992, chapter 5; Sanders & Van Wijk, in prep.).

6. Coherence relations and intentions

In recent years, accounts of discourse structure have been developed in which the notion of discourse purpose or intention is pivotal. A good example is the work of Grosz & Sidner (1986), who present their account as antagonistic to the coherence relation approach as advocated in this paper. In my view, it is far more attractive to view such a discourse intention approach as compatible with a coherence relation approach. Such a synthesis would account for several major weaknesses of the discourse intention approach: 1) it does not lead to a descriptively adequate analysis, 2) it is psychologically implausible and 3) it has hardly any explanatory power.

The integration of discourse purpose and coherence relations in one theory of discourse representation would contribute to the solution of these problems. One interesting starting point would be the correlation between classes of coherence relations and different discourse types / purposes. For instance, the difference between semantic and pragmatic relations correlates with expository and argumentative discourse, of which the purposes can be formulated as to inform and to persuade respectively (Brewer, 1980). Van de Vijfeyke (1992) shows that expository discourse is characterized by a relatively high number and a more dominant position of semantic vs. pragmatic relations, whereas pragmatic relations occur more and in more dominant places in advertisements.

This type of concrete analytic and empirical work is needed for an augmented theory of discourse structure and coherence. The viability of such a synthesis is underscored by recent developments in the area of Natural Language Generation, in which Discourse purposes ('goal hierarchies') are combined with (an organized set of) coherence relations ('discourse structure relations') in order to arrive at a text planner (Hovy, Lavid, Maier, Mittal & Paris, 1992).

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