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Anaphora Resolution and Subordination in Discourse Structure

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It is well-known and widely discussed that anaphora resolution can be blocked by negated terms (e.g. (1)) or conditional sentences (e.g. (2)). So-called donkey sentences exemplify this phenomenon that is predominantly described within the DRT framework (Kamp & Reyle, 1993):

(1) No man walks in the park. He whistles.

(2) If a farmer owns a donkey, he beats it. He hates it.

DRT predicts that the pronoun *he* cannot refer back to *no man* or *a farmer*, respectively. The explanation the theory offers is based on the assumption that the discourse referents are embedded within the logical operators *negation* and *implication*.

However, note that the anaphora resolution in (2) can still be made. The whole sequence sounds quite odd, but it is nevertheless understandable. Subordination indicated by a discourse marker like *after* exhibits a similar effect:

(3) After the farmer beat the donkey, it smashed the cart. He was arrested later by the local policeman because of cruelty to animals.

The reversed construction does not cause any problems for the anaphora resolution: (3') *The farmer beat the donkey, before it smashed the cart. He was arrested later by the local policeman because of cruelty to animals.*

This phenomenon was investigated by Cooreman & Sanford (1996). Their psychological experiments clearly indicate that subjects have a strong preference for the discourse referent in the main clause to be referred to by a pronoun in a subsequent sentence. These findings suggest that the effects of syntactic subordination should be taken into account for a cognitively adequate discourse grammar.

Moreover, the observation that a subordinated clause does not make the discourse referent easily accessible for anaphora resolution points out that the DRT approach does not fully explain cases such as (2) and (3). A hierarchical notion of discourse structure as proposed by Segmented DRT (Asher, 1993) is needed here to explain the subordination effect. By introducing discourse relations (e.g. *narration, elaboration*) that form discourse segments, one can normally make precise predictions about anaphora resolution, but not for these data. The sequences would both be modelled as a *narration* between the subordinated and the main clause. According to SDRT the first segment (i.e. *the farmer beat the donkey*) would be 'closed off' and consequently not available for anaphora resolution in (3) as well as in (3').

Instead of the discourse structure proposed by SDRT, I use a Tree Description Grammar (TDG) (Kallmeyer, 1996) reflecting the subordination effect observed. Following Schilder (1997) an extension of SDRT via a TDG is given in order to express the discussed subordination phenomenon more appropriately. This computational approach to discourse grammar is extended by providing a discourse tree for (3) according to the assumption that only the right frontier of a discourse parse tree is available for further attachment (Webber, 1991). Taking the findings of Cooreman & Sanford (1996) into account, a discourse tree is given such that the anaphora resolution cannot be made to discourse referents in a subordinated clause. Although these discourse referent are deeply embedded into the discourse structure, they are nevertheless still obtainable. Hence the discourse structure suggested provides an explanation for the difficulties resolving the anaphoric link in (3).

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