DISCOURSE COHERENCE AND VP ELLIPSIS WITH SPLIT ANTECEDENTS

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Prüst et al. 1994 propose a model of discourse coherence that resolves VP ellipsis reference as a side effect of coherence establishment. This paper extends that framework using the Cause-Effect model from Kehler 2002. The extended framework allows a straightforward account of split antecedent cases of VP ellipsis from Webber 1978.

1. Introduction

Cases of VP ellipsis with antecedents in multiple clauses ("split antecedents") such as (1a), whose interpretation is shown in (1b), interest researchers studying the syntax, semantics, and pragmatics because they pose a challenge for syntactic theories of VP ellipsis and their interpretations are strongly connected to pragmatic factors.

(1) a. Wendy is eager to sail around the world and Bruce is eager to climb Kilimanjaro, and **they will** if they have enough money. (Hardt 1999, adapted from Webber 1978)

b. Wendy will sail around the world and Bruce will climb Kilimanjaro.

I will show that this interpretation falls out of a general account of discourse coherence if we assume that VP ellipsis reference is resolved as a side effect of discourse coherence establishment.

1.1. Previous Approaches

This paper aims to re-examine the hypothesis advanced by Prüst et al. 1994 that verb phrase ellipsis reference is resolved as a side effect of discourse coherence establishment. Incorporating the Cause-Effect coherence model of Kehler 2002 will allow an analysis split antecedent VP ellipsis.

Two recent accounts of split antecedents have recognized the importance of discourse factors but failed to provide a specific theory of how discourse factors interact with ellipsis to produce the observed meanings. Hardt 1999 uses dynamic semantics

to model split antecedents. He claims that a salient mapping of subjects to predicates gives the reading of (1). Elbourne 2008 treats elided VPs as definite descriptions in a situation semantics. Contextual domain restrictions match each elided VP to its subject in (1). Both acknowledge discourse factors at work, but are vague about how they work.

One thing Hardt and Elbourne have in common is that they conclude VP ellipsis and pronouns are similar. This similarity is represented in the present account by modeling both as unification variables.

2. A Discourse Grammar

Kehler 2002 identifies three broad families of discourse coherence, with many specific coherence relations within each family. I will show that the Parallel and Result relations predict the reading of (1).

2.1. The Parallel Relation

The Parallel relation is illustrated in (2).

(2) a. Mary likes John.
b. Susan does too.

To account for this sort of example, Prüst et al. define a unification algebra over the well formed formulas of a familiar typed logic. Their logic adds sorts and variables over sorts, a preorder relation on logical formulas, and two operators, the Most General Unification and the Most Specific Common Denomenator[1].

Sorts are written in small caps and a **variable** over a sort is underlined. For example, $\underline{\text{GIRL}}$ ranges over the girls in the model. Variables with the same subscript must covary; variables without a subscript vary independently.

Formulas in the logic are (pre)ordered by specificity. $\phi \sqsubseteq \psi$ is read ϕ is at least as specific as ψ. For example, mary$\sqsubseteq\underline{\text{GIRL}}\sqsubseteq\underline{\text{HUMAN}}\sqsubseteq\underline{\text{ENTITY}}$.

The **MGU** of ϕ and ψ, written $\phi\sqcap\psi$, is the most general object χ such that $\chi \sqsubseteq \psi$ and $\chi \sqsubseteq \phi$. If such an object exists, we say ϕ and ψ unify.

The **MSCD** of ϕ with respect to ψ of the same type, written $\phi \ominus \psi$, is the most specific object χ such that $\phi \sqsubseteq \chi$ and χ and ψ unify.

The discourse grammar is a set of rules that say how the attributes of a complex discourse are derived from the attributes of its parts. The Parallel rule tracks four attributes. The logical form, or **lf**, is the context-invariant meaning of the discourse. The **context** is the contextually determined meaning of the discourse. The **rel** attribute is the discourse coherence relation that holds between the constituents of a complex discourse unit. The **MSCD** attribute is the MSCD of the discourse. The Parallel rule restates Prüst et al.'s List rule as (3).

[1]For a more detailed specification of the syntax and semantics of the logic and the unification algebra defined over it, see Prüst et al. 1994

(3) PARALLEL:

$$\begin{bmatrix} \text{lf} & \boxed{1}\Re\boxed{2} \\ \text{context} & \boxed{1}\Re\boxed{2} \\ \text{MSCD} \quad \boxed{4} & \boxed{1}\ominus\boxed{3} \\ \text{rel} & \textsc{Parallel} \end{bmatrix} \rightarrow \begin{bmatrix} \text{lf} & \boxed{1} \\ \text{context} & \boxed{1} \end{bmatrix}, \begin{bmatrix} \text{lf} & & \boxed{3} \\ \text{context} & \boxed{2} & \boxed{4}\sqcap\boxed{3} \end{bmatrix}$$

Constraints:

$\boxed{1}$ has no variables.

$\boxed{4}$ has no variables over a trivial sort.

$\Re$ is the propositional relation expressed by a clausal connective. The default relation is propositional conjunction when no other relation is expressed.

The Parallel rule calculates the MSCD of it's daughters, and fills in the context value of its second daughter by unifying the MSCD with that daughter's lf, which resolves variable references.

The Parallel rule parses the discourse in (2) and resolves the VP ellipsis reference as shown in (4). In the lf of *Susan does too*, $\underline{\text{VP}}$ is a variable that ranges over VP meanings (type $\langle e, t\rangle$). It represents the missing complement to the auxiliary *does*.

(4)

$$\begin{bmatrix} \text{lf} & \text{like(john)(susan)}\wedge\text{like(john)(mary)} \\ \text{context} & \text{like(john)(susan)}\wedge\text{like(john)(mary)} \\ \text{MSCD} & \text{(like(john))}(\underline{\text{GIRL}}) \end{bmatrix}$$

$$\begin{bmatrix} \text{lf} & \text{(like(john))(mary)} \\ \text{context} & \text{(like(john))(mary)} \end{bmatrix} \qquad \begin{bmatrix} \text{lf} & (\underline{\text{VP}})\text{(susan)} \\ \text{context} & \text{(like(john))(susan)} \end{bmatrix}$$

2.2. Cause-Effect Relations

Kehler 2002, Chapter 6 provides an account of pronouns where pronouns are represented as variables and their reference is resolved by coherence unification. He illustrates this with the example (5). The discourse presupposes the world knowledge encoded by formula (6). The $\mapsto$ arrow states that the truth of the proposition on the left of the arrow leads one to expect the proposition on the right to hold.

(5) City council denied the protesters a permit because...

a. ...they feared violence.

b. ...they advocated violence.

(6) [fear($\underline{\text{RESULT}_1}$)($\underline{\text{GROUP}_3}$) $\wedge$advocate($\underline{\text{RESULT}_1}$)($\underline{\text{GROUP}_2}$)$\wedge$
allow-to-cause($\underline{\text{RESULT}_1}$)($\underline{\text{GROUP}_2}$)($\underline{\text{ENTITY}_4}$)]
$\mapsto$deny($\underline{\text{ENTITY}_4}$)($\underline{\text{GROUP}_2}$)($\underline{\text{GROUP}_3}$)

The discourses (5a) and (5b) are coherent by Kehler's Explanation relation. Explanation coherence is established by unifying the lf of the first clause with consequent of the presupposed $\mapsto$ implication. The lf of the second clause is unified with

a term in the antecedent of (6). It's this unification of the second clause that causes *they* to be interpreted as 'city council' in (5a) and 'the protesters' in (5b).

The **presup** attribute is used by Cause-Effect relations to store coherence-generated presuppositions. The unification process that establishes Explanation described above is captured by the Explanation rule shown in (7).

(7) EXPLANATION:

$$\begin{bmatrix} \text{lf} & \boxed{1}\,\Re\,\boxed{2} \\ \text{context} & \boxed{1}\,\Re\,\boxed{2} \\ \text{presup} & ((\phi \wedge \psi) \mapsto \chi) \sqcap ((\boxed{3} \wedge \psi) \mapsto \boxed{4}) \\ \text{rel} & \text{EXPLANATION} \end{bmatrix} \rightarrow \begin{bmatrix} \text{lf} & & \boxed{4} \\ \text{context} & \boxed{1} & \chi \sqcap \boxed{4} \end{bmatrix}, \begin{bmatrix} \text{lf} & & \boxed{3} \\ \text{context} & \boxed{2} & \phi \sqcap \boxed{3} \end{bmatrix}$$

$(\phi \wedge \psi) \mapsto \chi$ and $(\boxed{3} \wedge \psi) \mapsto \boxed{4}$ unify.
$\phi \wedge \psi \mapsto \chi$ is salient world knowledge or can be accommodated by the participants in the conversation.
$\Re$ is the propositional relation expressed by a clausal connective. The default relation is propositional conjunction when no other relation is expressed.

3. Split Antecedents

Returning now to (1), which I've simplified in (8), we can clearly see that the first two clauses are Parallel, and each Parallel clause stands in the Cause-Effect relation Result with the ellipsis containing clause. Each Parallel clause is connected to the ellipsis clause by the discourse presupposition (9).

(8) Wendy is eager to sail around the world and Bruce is eager to climb Kilimanjaro, and **they will**.

(9) [want-to'($\underline{\text{VP}}_j$)($\underline{\text{HUMAN}}_i$)] $\mapsto$will'($\underline{\text{VP}}_j$)($\underline{\text{HUMAN}}_i$)]

The reading we get for the VP ellipsis clause is the result of unifying each of the Parallel clauses with the antecedent of its own instance of (9), unifying an instance of the second clause with the consequence of each instance of the presupposition, and combining the two specifications of the second clause using the same operation connecting the Parallel clauses. This process is captured by the Result^2 rule (10)^2.

(10) RESULT^2:

$$\begin{bmatrix} \text{lf} & \boxed{1}\,\Re_1\,\boxed{2} \\ \text{context} & \boxed{1}\,\Re_1\,\boxed{2} \\ \text{presup} & \left\{ \begin{array}{l} \phi, \\ (\psi \mapsto \chi) \sqcap (\boxed{3} \mapsto \boxed{5}), \\ (\xi \mapsto \eta) \sqcap (\boxed{4} \mapsto \boxed{5}) \end{array} \right\} \\ \text{rel} & \text{RESULT} \end{bmatrix} \rightarrow \begin{bmatrix} \text{lf} & & \boxed{3}\,\Re_2\,\boxed{4} \\ \text{context} & \boxed{1} & (\boxed{3} \sqcap \psi)\Re_2(\boxed{4} \sqcap \xi) \\ \text{rel} & & \text{PARALLEL} \end{bmatrix}, \begin{bmatrix} \text{lf} & & \boxed{5} \\ \text{context} & \boxed{2} & (\boxed{5} \sqcap \chi)\Re_2(\boxed{5} \sqcap \eta) \end{bmatrix}$$

Constraints:

[2]Both Result and Result^2 can be generalized to a Result^n rule schema. See Baker prep for this generalized rule.

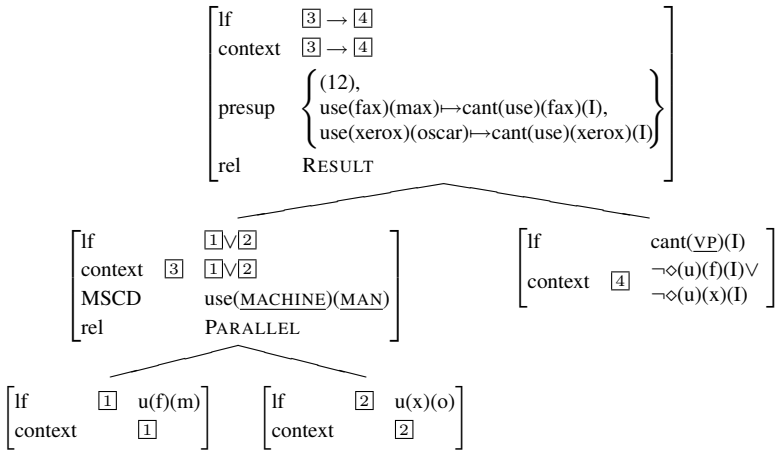
$\psi \mapsto \chi$ and ($\boxed{3} \mapsto \boxed{5}$ unify, and $\xi \mapsto \eta$ and $\boxed{4} \mapsto \boxed{5}$ unify.
ϕ is salient world knowledge or can be accommodated by the participants in the conversation.
$\psi \mapsto \chi$ and $\xi \mapsto \eta$ instantiate ϕ

Result[2] is illustrated in more detail with (11). The presupposition (12) accounts for (11), resulting in the discourse parse shown in (13).

(11) Whenever Max uses the fax or Oscar uses the Xerox, I can't. (Fiengo and May 1994)

(12) use'($\underline{\text{MACHINE}}_j$)($\underline{\text{HUMAN}}_i$) $\mapsto$ $\neg$(can'(use'))($\underline{\text{MACHINE}}_j$)($\underline{\text{HUMAN}}_k$)

(13)



Interestingly, the lf of the discourse is strictly more general than the intuitive reading for this discourse. But the presuppositions must also be satisfied for the discourse to be felicitous, correctly predicting that (11) is only felicitous when I can't use whichever of the fax or the Xerox is being used at the time.

Prüst et al. offer (14) as an example of a discourse that does not have a split antecedent reading for the elided VP.

(14) Maaike dances. Brigitte sings. Saskia does too.

The discourse grammar I propose predicts no split antecedent reading here as well[3]. There is no salient presupposition that would allow Cause-Effect coherence to felicitously apply in this context and supply the split antecedent reading.

Elbourne 2008 uses (15) to show that changing the discourse environment of (14) can provide a split antecedent reading.

[3]In fact, the Parallel relation must be modified slightly to allow a single clause to be Parallel to both subparts of a complex clause to get any reading here at all.

(15) Saskia, being a competitive type, has managed to acquire all the skills Maaike and Brigitte possess. Maaike dances. Brigitte sings. Saskia does too.

But this new discourse environment makes an Cause-Effect presupposition salient, allowing Cause-Effect coherence to hold between the two Parallel antecedent clauses and the ellipsis clause. The present account predicts this split antecedent reading the same way it predicts the reading of (8).

4. Conclusion

There is a large debate in the literature over whether or not there is syntax in the ellipsis site, with Merchant 2001; Fiengo and May 1994 arguing that there is syntax in the ellipsis site and Hardt 1999 arguing that there is not. Though the present account would seem to be a semantic theory of ellipsis, with no syntax in the ellipsis site, it is also compatible with a syntactic theory of ellipsis. If unification variables range over syntactic objects and world knowledge is represented syntactically, then the coherence analysis is compatible with the arguments from Merchant 2001; Merchant prep and Frazier and Clifton 2006 that the ellipsis site contains syntactic structures.

Unlike Elbourne's 2008 model, this model makes very few assumptions about the syntax of the ellipsis site. It shows that a better understanding of general cognitive abilities like inferences to the most coherent understanding of a situation we can simplify our accounts of complex natural language phenomena.

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