The Moving Right Frontier

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Abstract

This paper analyzes systematic cases of revision of the discourse structure entailing a modification of the right frontier. We show that the coordinating or subordinating nature of discourse relations plays a major role in this revision, examining in particular a relation typical in narratives, Result, as well as a family of dialogues relations: content-relations introduced by interrogatives.

1 Introduction

The RIGHT FRONTIER CONSTRAINT on accessibility and possible discourse continuations, introduced in [Webber, 1988], is exploited in several theories of discourse. Most of these theories also make use of discourse relations, which sometimes affect the treelike discourse structure and as a result the definition of the *right-frontier*. For instance, some theories make use of two kinds of relations behaving differently in the discourse structure LDM [Polanyi, 1988], [Grosz and Sidner, 1986], RST [Mann and Thompson, 1987], SDRT [Asher, 1993]). SDRT largely exploited this difference in behavior to explain many phenomena at the semantics-pragmatics interface [Asher and Lascarides, 2003]. In SDRT, a *coordinating* relation pushes the right frontier to the right, closing-off its attachment point, while a *subordinating* relation extends the right frontier downward —without necessarily introducing a complex segment— and leaves open its attachment point for further attachments.

The "coord/subord" distinction is considered by most authors to be part of the definition of the discourse relations in a stable way. In other words, a given relation is by essence of a given kind. However, studying the actual substance of the "coord/subord" distinction, [Asher and Vieu, 2005] have shown that there are cases in which coordinating relations may become subordinating. This means that a given continuation can make a coordinating attachment become subord, that is, it can revise the structure and change the right frontier, opening an attachment point that was closed. Actually, we will see in this paper that the opposite change can occur as well. In dialogs, questions are attached to the context with a Rel_q, the question version of the relation Rel that would have attached an answer to the question to the same context. Answering the question brings in both a relation between the question and the answer (QAP), and the relation Rel between the context and the answer. Since relations Rel_q are proved to be subord, if the corresponding assertive relation Rel is coord, answering a question modifies the right frontier, closing off an open attachment point.

In the next section we will describe the right frontier change when a coordinating relation, *Result*, becomes subordinating. Then, we will examine the dialog relations $Narration_q$ and $Explanation_q$ to show

how, in some cases, answering a question alters the right frontier.

2 Chameleon relations in monologic discourse

In [Asher and Vieu, 2005], several criteria to decide whether a given relation is coordinating or subordinating are proposed. On the basis of these criteria, it is also shown that some relations are only coordinating by default. Punctuation and coordination particles can force them to become subord, as shown on the two examples reported here, taken from [Asher and Vieu, 2005]:

(1) (a) Lea screamed (π_1), so the burglar ran away (π_2).

    (b) Lea screamed (π_1), so the burglar ran away (π_2). Max woke up (π_3). #She also got a sore throat (π_4).

    (c) Lea screamed (π_1), so the burglar ran away (π_2) but Max woke up (π_3). She also got a sore throat (π_4).

In 1-b, that Max woke up can't be seen as a result of Lea's scream. It is simply understood as a continuation of the story that is being told, i.e., π_3 is attached by *Narration* to π_2. This is shown by the impossibility to continue the text with π_4, for the anaphor in the parallel-marker *also* can't be solved. This contrasts with 1-c in which the punctuation and the particle *but* force the attachment of π_3 to π_2 by *Contrast* as well as some kind of *Continuation*, creating a complex segment which can be seen as collecting all the consequences of Lea's scream. In this context, it is now possible to continue to extend this complex segment with π_4. We see on example 1-c that *Result* changes from coord to subord and as a result, the structure built with the attachment of π_2 to π_1, Fig.1:1-a, is *revised* when attaching π_3 to obtain that of Fig.1:1-c. The right frontier is modified, reopening π_1.

It is suggested in [Asher and Vieu, 2005] to handle this phenomena by stating that *Result* is by default a coordinating relation, and that this default can be overridden by more specific discourse clues such as punctuation and the discourse markers for *Contrast* (but) and *Parallel* (also) in our examples. This approach is not formally implemented in SDRT yet, but it would actually involve using revision mechanisms. Another way of doing could be to exploit the MAXIMIZE DISCOURSE COHERENCE constraint, leaving the nature of *Result* by itself underspecified, using additional clues to decide on this, possibly with subsequent clauses. In this way, if the context supports an additional inference to *Narration*, as in 1-b, *Result* will be coord, while if the context supports the creation of a complex segment gathering several "results", as in 1-c, *Result* will be subord.

This leads us to point out that MDC and the right-frontier constraints actually interact. Current SDRT using MDC considers the possibility of leaving discourse relations underspecified after an update, delaying the decision until enough information is available. This allows to deal with example (2), awkward at first but perfectly alright complete (taken from [Caenepeel, 1991] and [Asher and Lascarides, 2003]).

(2) (a) Joe was released from hospital (π_1). ?He recovered completely (π_2).

    (b) Joe was released from hospital (π_1). He recovered completely (π_2) and they needed the bed (π_3).

    (c) Joe was released from hospital (π_1). He recovered completely (π_2), then he resumed training (π_3).

In this example, the relation between π_1 and π_2 is underspecified before the utterance of π_3, which makes clear in 2-b that it is an *Explanation*, a subord relation, and in 2-c a *Narration*, a coord relation.

[Asher and Lascarides, 2003] do not discuss how to deal with such underspecification in details, although it is quite clear that this case isn't dealt with the construction of a number of alternative SDRSs, as for truly ambiguous discourses. π_2 is surely attached to π_1, and the point then is: since the relation is left
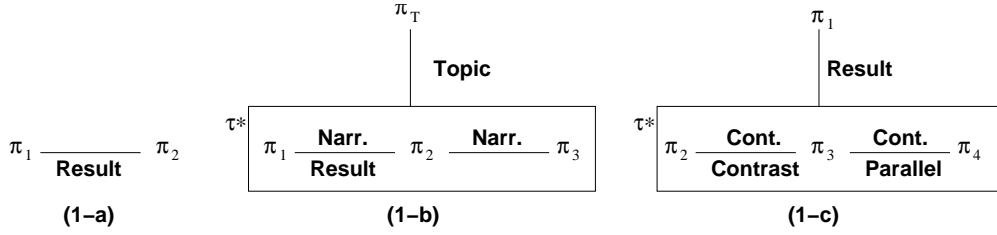
$\pi_1 \underset{\textbf{Result}}{\rule{2cm}{0.4pt}} \pi_2$

(1–a)

π_T — **Topic**

$\tau*$ $\left[\pi_1 \underset{\textbf{Result}}{\overset{\textbf{Narr.}}{\rule{2cm}{0.4pt}}} \pi_2 \underset{}{\overset{\textbf{Narr.}}{\rule{2cm}{0.4pt}}} \pi_3 \right]$

(1–b)

π_1 — **Result**

$\tau*$ $\left[\pi_2 \underset{\textbf{Contrast}}{\overset{\textbf{Cont.}}{\rule{2cm}{0.4pt}}} \pi_3 \underset{\textbf{Parallel}}{\overset{\textbf{Cont.}}{\rule{2cm}{0.4pt}}} \pi_4 \right]$

(1–c)

Figure 1: Chameleon relations

underspecified, its nature too, so what are the sites available after the attachment, i.e., what is the right-frontier? The formal definition of SDRS update in [Asher and Lascarides, 2003] considers that only co-ord relations induce a constraint; so an underspecified relation is dealt with just as a subord one, leaving all the sites available. This seems quite reasonable in this case. But if the same is applied for the "underspecification" of the nature of *Result*, it amounts to consider *Result* as subord by default, rather than coord by default. A closer examination of a larger corpus of data is needed before deciding on the best way to handle the nature of *Result*, either by revision or by underspecification and MDC.

Such a change of nature is fortunately not so frequent. [Asher and Vieu, 2005] suggests that *Narration*, a prototypical coordinating relation in narratives, is always coordinating, and that no subordinating relation can be turned into a coordinating one. We do not take issue on this precise point here, but, examining dialogs, we will now see that something very close to turning a subordinating relation into a coordinating one can in fact occur and alter the right frontier accordingly.

3 Content relations and interrogatives

Some questions require from their answers to satisfy a given rhetoric relation with the previous discourse context. These questions (introducing relations like $Explanation_q$, $Narration_q$ ...) have been briefly presented in [Asher and Lascarides, 2003] but we believe that the structural aspect of their treatment in SDRT requires more attention as spotted in [Prévot et al., 2002, Prévot, 2004]. In order to show this, we are going to consider interrogatives introducing subordinating or coordinating relations. We will pay a special attention on the state of the right frontier after the question resolution.

3.1 $Narration_q$ **versus** $Elaboration_q$

Narration and *Elaboration* are among relations that do not exhibit a chameleon behaviour. *Narration* is coordinating and *Elaboration* subordinating. $Narration_q$, $Elaboration_q$ and QAP are shown to be subordinating in [Asher and Lascarides, 2003].

(3) (A_1) Yesterday I visited Fez, it was great!

(B_2) Really? Where did you go?

(A_3) In the morning, I've been in the medina.(π_3)

(A_4) I started by getting lost (π_4)

(A_5) and then a child guided me to the souk. (π_5)

(B_6) the tanner's souk?(π_6)

(A_7) No the shoemaker's one. (π_7)

(A_8) There were some wonderful babouches there! (π_8)

(B_9) He took you to his uncle's shop, right? (π_9)

In example (3), the subordinating nature of *Elaboration*, $Elaboration_q$ and *Background* is co-
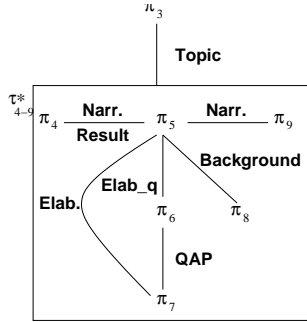
Figure 2: Discourse structure for (3)

Figure 3: Discourse structure for (4)

herent and predicts correctly that π_5 is open for pursuing the story (see fig 2).[1] In the next example the interrogative (4) will introduce a $Narration_q$.

(4)   (A_1) Yesterday I visited Fez, it was great!

    (B_2) Really? Where did you go?

    (A_3) In the morning, I've been in the medina.(π_3)

    (A_4) I started by getting lost (π_4)

    (A_5) and then a child guided me to the souk. (π_5)

    (B_6) Then, what did you do?(π_6)

    (A_7) There I recognized the place (π_7)

    (A_8) and I went to the shoemaker's of the other day.(π_8)

    (B_9) # He took you to his uncle's shop, right?(π_9)

In this case, we face two problems. Firstly, the structure predicts wrongly the availability of π_5 for further attachments, for instance for π_9, which is unacceptable (see figure 3). Secondly, the subord nature of $Narration_q$ and QAP results in an unusual "subord" $Narration$ between π_5 and π_7 that cannot accommodate the topic constraint that is part of the semantics of $Narration$ [Asher and Lascarides, 2003].

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[1]In [Vieu and Prévot, 2004], we applied the test proposed in [Asher and Vieu, 2005] and we found out that *Background* was a subordinating relation.
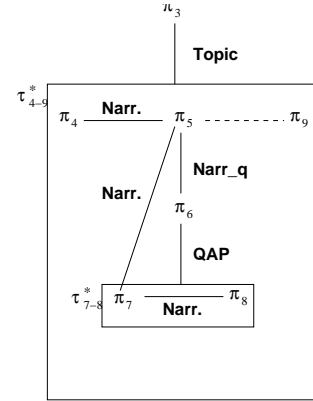
These two problems point towards the necessity of a coordinating attachment between π_5 and some other node. Indeed, since π_5 is not accessible for π_9 in example (4), some node on its right must block it. We conjecture, as we will see in Section 3.3, that this additional node be attached, instead of the answer, by the $Narration$ relation to π_5.

3.2   Another example

Since an important part of this paper is based on the previous example examination, we believe relevant to provide another example exhibiting a similar problem. This example was actually constructed with French language. We propose here the original examples (5) and (7) and their translation (6) and (8).

(5)   (A_1) Qu'est-ce que tu as fait samedi soir?

    (B_{2a}) Je suis allé chez Max avec une copine. (π_2)

    (B_{2b}) Il nous a fait un bon repas (π_3),

    (B_{2c}) on a discuté longtemps (π_4)

    (B_{2d}) et on a fini tard. (π_5)

    (A_3) Tu as beacoup bu? (π_6)

    (A_5) Non, je ne bois jamais(π_5)

    (B_6) Elle non plus?(π_6)

(6) Translation of (5)

   (A_1) What did you do on saturday night?

   (B_{2a}) I went to Max' place with a friend of mine. (π_2)

   (B_{2b}) He prepared us a good diner (π_3),

   (B_{2c}) we chatted for long time (π_4)

   (B_{2d}) and we finished very late. (π_5)

   (A_3) Did you drink a lot? (π_6)

   (A_5) No, I don't drink (π_7)

   (B_6) Neither she?(π_8)

Similarly to examples (3-4), (B_6) is acceptable in (5) and not in (7). This because in the first case, the question (A_3) introduce a potential *elaboration* while in the second case it introduce a *narration.*

(7) (A_3) Et ensuite, qu'est-ce que tu as fait? (π_6)

   (A_5) Je suis rentré tranquillement chez moi (π_7)

   (B_6) # Elle est restée chez Max?(π_8)

(8) Translation of (7)

   (A_3) And then, what did you do? (π_6)

   (A_5) I went home quietly. (π_5)

   (B_6) # She stayed at Max' place?(π_6)

3.3 A solution using a question-answer topic

The solution proposed, as presented in [Prévot et al., 2002, Prévot, 2004] is thus to create a *topic* constituent for the question-answer pair. This topic is a simple constituent whose content is the resolved question/answer pair. In case of simple answers, the content of elliptical answers to questions is already reconstructed in the answer constituent and therefore the topic is only a copy of the answer. But in case of complex answers the topic is built as an abstraction over the answers, just as for narrative topics. The establishment of the QAP relation generates this topic over the question-answer sequence and this topic is attached to the previous discourse with the expected assertive relation, with its expected type of attachment (see Fig 4). In this figure, γ is the target of the question α and β is the answer to α. The *Topic-Question* relation associates two constituents: $\tau*$, which is a complex constituent for the segment consisting of the question and the answer, and τ, which is the topic itself, a simple constituent built from the question and its answer(s). With our solution, what changes is the importance of the $Relation_q$ in the structure. It is in a first time crucial for tackling the coherence of the dialogue. And it becomes secondary once the structure is updated by the establishment of a satisfying answer to the question. The relation between and γ and β is actually established between γ and τ.

Surely $Narration_q$ still holds between π_5 and π_6 in example (4) but it is no more that important for accessibility issues. This $Narration_q$ is only part of the dialogue history but still helps increasing the overall coherence for the MAXIMIZE DISCOURSE COHERENCE constraint which prefers discourse interpretations offering the highest number of rhetorical links (among others criteria). Instead, $Narration$ between π_5 and τ takes on a more important role for the RIGHT FRONTIER CONSTRAINT.

Applying our proposal to examples (3) and (4) leads to the discourse tree represented on figures 5 and 6 respectively. Figure 6 shows that we correctly model the fact that π_5 is not available anymore for further attachment once the question π_6 is answered and closed. We correctly capture the unavailability of the discourse referents introduced in this constituent for pronominal anaphora resolution.

4 Conclusion

This paper has shown some limit cases for the RIGHT FRONTIER CONSTRAINT. The RFC is founded on coordinating/subordinating nature of relations and we explained that this nature is not as stable as believed. Moreover the importance of a given coherence relation might evolve during the interpretation. The RFC is therefore a discourse principle that need
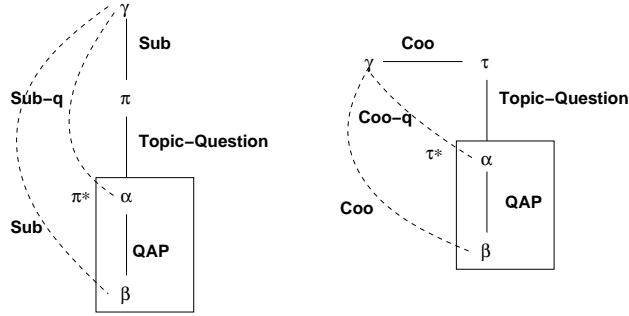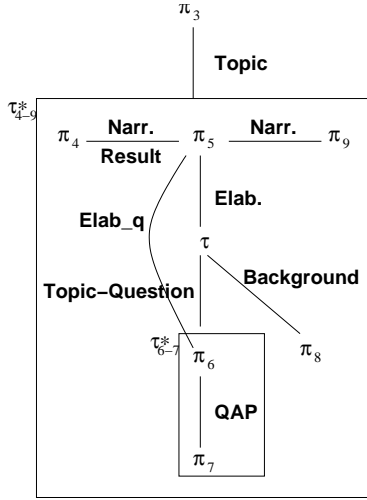
Figure 4: Question-Answer Attachment

Figure 5: New structure for (3)

Figure 6: New structure for (4)

to be used with care. We paid special attention to content-level relations introduced by interrogatives. We provided examples where discourse structure at the RIGHT FRONTIER has to be updated in a non-trivial way. We also proposed a method for tackling this issues. Nonetheless, we would like to emphasize that this treatment does not close the discussion about these kind of discourse structures involving interrogatives. Constructing these examples required some efforts and during the process we actually ende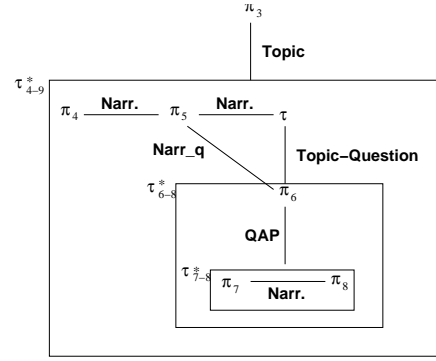d up many times finding examples that were strangely acceptable in spite of theoretical unaccessibility, because of, e.g., a $Narration_q$. We believe that this was mainly due to complex phenomena occurring in the construction of discourse topics, not only for question-answer pairs. This issue need to be addressed under the light of recent works on discourse topics [Asher, 2004].

Acknowledgments

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