

## ***A response to Marcu (2003). Discourse structure: trees or graphs?***

Florian Wolf  
MIT NE20-448  
Cambridge, MA 02139  
USA  
[fwolf@mit.edu](mailto:fwolf@mit.edu)

Edward Gibson  
MIT NE20-459  
Cambridge, MA 02139  
USA  
[egibson@mit.edu](mailto:egibson@mit.edu)

### **1 Goal of our research program**

In a critique of Wolf & Gibson (2003), Marcu (2003) argues for constraints on possible inferences for building discourse structures. In his discussion of our paper, Marcu mentions several such constraints on building discourse structures. In Section 2, we will discuss each of these constraints in more detail. However, more generally, we would like to point out the difference between Marcu's and our discourse coherence research program. Marcu (2003)'s goal seems to be to first specify a set of constraints on possible discourse annotations, and then annotate texts with these constraints in mind. The underlying assumption seems to be that otherwise the coherence annotation process is too unconstrained, and that annotators would be unable to agree on a discourse structure for a text without such constraints. However, we believe that this assumption is not valid. Our initial assumption was that given a reasonable taxonomy of discourse coherence relations, annotators can agree on a discourse structure for a text. In support of our assumption, we have annotated 135 texts from the Wall Street Journal and the AP Newswire with two annotators per text; for the 135 texts, inter-annotator agreement was 88.45%, per-chance agreement was 24.86%, and kappa was 84.63% (Wolf et al. (submitted)). We believe that these agreement figures refute Marcu (2003)'s underlying assumption that without more a priori constraints on the annotation process, no agreement on a discourse structure for a text could be reached. In contrast with Marcu (2003), the goal of our research program is to first determine which constraints on discourse structures are empirically viable. To us this seems to be the crucial first step in order to avoid arbitrary constraints on inferences for building discourse structures. We will argue that Marcu's set of constraints are intended to serve the purpose of maintaining tree structures, but are not empirically valid.

### **2 Marcu (2003)'s examples**

In his discussion of Wolf & Gibson (2003), Marcu (2003) argues for the following constraints on building discourse structures:

- Do not annotate "global" coherence relations, i.e. relations that are context-dependent and rely on text-level inferences
- Do not annotate cohesive links (this is only mentioned once in Marcu's response; reference is made to sentence-level constraints in some linguistic theories but no discourse-level examples or evidence are given)

- Do not annotate coherence relations between sources that are stated in a text
- An example of a constraint on inferences for building discourse structure: Marcu (2000)'s "compositionality criterion"

This section will point out why we believe the examples mentioned in Marcu (2003) do not constitute evidence against our approach.

## 2.1 Annotating "global" coherence relations

Marcu argues against annotating "global" coherence relations, i.e. coherence relations that can only be interpreted within context. As an example, he mentions the following text:

0. There is a train at Platform A.
1. Its destination is Rome.
2. There is another train at Platform B.
3. Its destination is Zürich.

For this example, we argue for the following discourse structure:

- 1 → 0 *elab*  
 3 → 2 *elab*  
 0 ↔ 2 *sim*  
 1 ↔ 3 *contr*

Marcu argues that the *contrast* relation between 1 and 3 cannot be interpreted in isolation, i.e. if one is presented only with 1 and 3:

1. Its destination is Rome.
3. Its destination is Zürich.

However, the difficulty with interpreting 1 and 3 in isolation is just because they contain pronouns. Consider the same sentences with the pronouns resolved:

1. Train A's destination is Rome.
3. Train B's destination is Zürich.

Now the sentences are easy to interpret, and it is clear that there is a *contrast* relation between 1 and 3. It is unclear how this coherence relation could only be interpreted within context, or would somehow be less important than other coherence relations in the discourse structure of the text above, as argued by Marcu (2003).

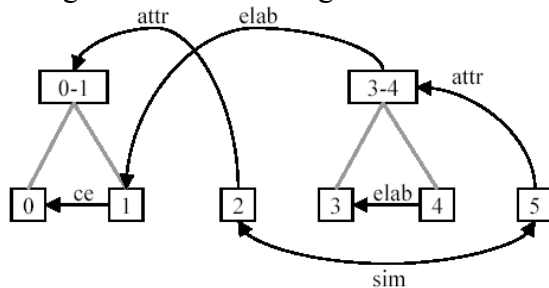
## 2.2 Annotating relations between sources

Marcu argues that coherence relations between sources should not be annotated. Marcu uses the following example:

0. Farm prices in October edged up 0.7% from September
1. as raw milk prices continued to rise,
2. the Agriculture Department said.

3. Milk sold to the nation's dairy plants and dealers averaged \$14.50 for each hundred pounds,
4. up 50 percent from September and up \$1.50 from October 1988,
5. the department said.

We argue for the following discourse structure for this example:



Marcu argues against annotating the *similarity* relation between sources (segments 2 and 5)<sup>1</sup>. His argument seems to be that if one were to annotate relations between all possible sources in a text, there would be too many discourse coherence relations. Marcu also mentions an example that is intended to support his point – a larger text with many attributions, “with many attributions spread all across the text “its CEO said”, “the CTO reported that”, “the COO declined that”, “the company said”, “the board of directors said”, etc.” (Marcu (2003)). However, instead of showing that annotating relations between sources leads to “*ludicrous consequences*” (Marcu (2003)), this example seems to do the opposite – it seems to stress even more the importance of annotating relations between sources. If a text has so many attributions, it seems that one would miss a substantial part of that text’s coherence or informational structure if one just ignored relations between the attributions mentioned in the text. One reason for why we believe coherence relations between sources should be annotated is that it should be possible, for example, to distinguish between situations where (1) Source A and Source B make similar statements; (2) Source A and Source B make contrasting statements; (3) Source A makes two similar statements; (4) Source A makes two contrasting statements.

### 2.3 From sentence structure to discourse structure?

As mentioned above, Marcu argues that not all possible coherence relations should be annotated. One of Marcu’s arguments seems to be that just as there are constraints on what to annotate on a sentence level, there should be constraints on what to annotate on a discourse level. Marcu (2003) mentions an example of constraints on annotating inter-sentential structures:

“After walking hand in hand along the river, Mary and John sat on the bank playing with their bare feet in the cold water.”

<sup>1</sup> Notice that even if we did not annotate the *similarity* relation between 2 and 5, there would still be a crossed dependency between the *attribution* relation between 2 and 0-1, and the *elaboration* relation between 3-4 and 1. Marcu (2003) does not address that point.

Marcu argues that no linguistic analysis of the sentence above would annotate a relation between the words *river*, *bank*, and *water*, although, according to Marcu, establishing such links clearly seems necessary in order to understand the semantics of the sentence.

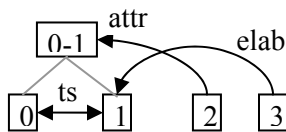
However, Marcu's argument is problematic. It is not clear how constraints on one level of linguistic structure (e.g. sentence structure) has any a priori bearing on constraints on another level of linguistic structure (e.g. discourse structure). Marcu (2003) does not present any argument or evidence as to why constraints on sentence-level structure should also hold for discourse-level structure<sup>2</sup>.

#### 2.4 Marcu (2000)'s "compositionality criterion"

Marcu argues for his "compositionality criterion" (Marcu (2000)) as a limit on the number and kinds of allowable inferences when building a discourse structure. According to that compositionality criterion, "*a discourse relation can hold between two large spans only if that relation also holds between the most important units in the spans*" (Marcu (2003)). However, it is unclear what motivates this compositionality criterion. Furthermore, it is not clear how this criterion limits coherence structures to trees. Consider the following example:

0. The flight Sunday took off from Heathrow Airport at 7:52pm
1. and its engine caught fire 10 minutes later,
2. the Department of Transport said.
3. The pilot told the control tower he had the engine fire under control.

We propose the following coherence structure for this example (*ts* is a *temporal sequence* relation):



Discourse segments 0 and 1 are both "Nuclei" (Marcu (2000)). Therefore Marcu (2000)'s compositionality criterion does not force the *elaboration* relation between 1 and 3 to hold between 0 and 3, or 0-1 and 3, instead. Thus, it seems that Marcu (2000)'s compositionality criterion does not enforce trees as a discourse structure.

### 3 Conclusion

Marcu (2003), in a critique of Wolf & Gibson (2003), argues for a priori constraints on allowable inferences for building discourse coherence structures. Marcu (2003) argues that the shortcoming of our approach is that we do not place such constraints on building a discourse structure. Here, in a response to Marcu (2003), we argue that Marcu (2003)'s a priori constraints are counterproductive because they are arbitrary. Instead of

<sup>2</sup> Even if it were true that sentence-level constraints were relevant to discourse-level constraints, it is unclear whether semantic relations such as the ones between *river*, *bank*, and *water* really should not be a part of sentence structure. For example, graph-based accounts of sentence structure like Skut et al. (1997) would allow annotating such relations as a part of sentence structure.

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specifying constraints a priori, it should be determined through empirically based research what these constraints are. Furthermore, we pointed to the high inter-annotator agreement reported in Wolf et al. (submitted), which speaks against Marcu (2003)'s underlying assumption that a priori constraints on discourse annotation are necessary because otherwise the annotation process would be too unconstrained, and annotators could not agree on a discourse structure for a text.

#### 4 References

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