Donkey Anaphora and Beyond

Workshop “Indefinites in Discourse” - June 27, 2014

Outline

• The problem:
  • Anaphora beyond donkey sentences

• Two proposed solutions:
  • Roberts (1989): Modal Subordination
  • Geurts (2011): Piggyback Anaphora

• A novel look at donkeys:

• Conclusion and Open Issues
Donkey Anaphora

1. If a farmer owns a donkey, he beats it.
   Every farmer who owns a donkey beats it.

   \[ \forall x \forall y \ (\text{farmer}(x) \land \text{donkey}(y) \land \text{own}(x,y) \rightarrow \text{beat}(x,y)) \]
   \[ \forall x \ (\text{farmer}(x) \land \exists y \ (\text{donkey}(y) \land \text{own}(x,y)) \rightarrow \text{beat}(x,y)) \]

- “A donkey pronoun is a pronoun that lies outside the antecedent of a conditional (or outside the restrictor of a quantifier), yet covaries with some quantificational element inside it, usually an indefinite.” (Barker & Shan 2008:2)

Analyzing Donkey Anaphora in DRT:
Kamp & Reyle (1993)

If a farmer owns a donkey he beats it.

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>farmer(x)</th>
<th>donkey(y)</th>
<th>x owns y</th>
<th>[ \Rightarrow ]</th>
<th>u</th>
<th>v</th>
<th>u=x</th>
<th>v=y</th>
<th>u beats v</th>
</tr>
</thead>
</table>

\[ \forall xy \ ((\text{farmer}(x) \land \text{donkey}(y) \land \text{own}(x,y)) \rightarrow \exists uv \ (u=x \land v=y \land \text{beat}(u,v))) \]
Anaphora Beyond Donkey Sentences?

- As has been pointed out by Roberts (1989), early DRT had little to say about anaphora beyond ‘donkey’ (and similar) sentences:

2. If John bought a book, he’ll be home reading it by now.
   
   2.1. #It’s a murder mystery.
   
   2.2. It’ll be a murder mystery. / It’s probably a murder mystery.

3. Falls John sich ein Buch gekauft hat, dann wird es jetzt gerade lesen.

   3.1. #Es ist ein Krimi.
   
   3.2. Es wird wohl ein Krimi sein. / Es ist bestimmt / sicherlich / wahrscheinlich ein Krimi.

- This criticism is still, by and large, valid nowadays. In the following I will argue that we can gain deeper insight into the underlying phenomena by taking coherence relations into account (Kehler 2002, 2007, 2011).

Roberts 1989 - Modal Subordination

2. If John bought a book, he’ll be home reading it by now.

   2.1. #It’s a murder mystery.
   
   2.2. It’ll be a murder mystery. / It’s probably a murder mystery.

- (2.2) “contains the same modal auxiliary will as the consequent of the preceding conditional sentence, and it is readily interpreted as an extension of the nonfactual mood.” (Roberts 1989:696)
Roberts 1989 - Modal Subordination

4. A thief might break into the house. He would take the silver.

- “In general, then, the antecedent of conditional sentences serves as an explicit hypothetical addition to the common ground against which the consequent is to be evaluated. In sentences which are not conditional in form, modal subordination involves the pragmatic accommodation of a contextually salient proposition (or propositions) to serve as antecedent for the nonfactual clause.” (Roberts 1989:700)

The Boundaries of Modal Subordination

- Wide empirical coverage can be achieved with the help of modal subordination, but, as Roberts herself points out, not a complete one.

5. Each degree candidate walked to the stage. He took his diploma from the dean and returned to his seat.

6. Each student in the syntax class was accused of cheating on the exam, and he was reprimanded by the dean.

7. #Each student in the syntax class was accused of cheating on the exam, and he has a Ph.D. in astrophysics.
8. You must write a letter to your parents. It has to be sent by email. The letter must get there by tomorrow.

9. Harvey courts a girl at every convention. She always comes to the banquet with him. The girl is usually also very pretty.

10. If Mary had a car, she would take me to work in it. I could drive the car too.

11. I wish Mary had a car. She would take me to work in it. I could drive the car too.

- According to Geurts, the relevant anaphors “are piggybacking on the interpretation of the expressions in whose scope they occur.” (Geurts 2011:1990)

- Geurts concentrates on “those cases where piggyback anaphora are enabled by overt quantification over individuals, worlds, and so on.” (Geurts 2011:1990)

---

In contrast to Roberts’ account, the interpretation of piggyback anaphora relies on bridging inferences licensed by the interpretation of the involved quantifiers. These bridging inferences are entailments, i.e., they are logical inferences.

(30) a. Wilma may have bought a car, It, may be a Volkswagen.
   b. [x: Wilma(x),
      \( [y: \text{car}(y), x \text{ bought } y], \)
      \( [z: \text{VW}(z)] \)
   c. [x: Wilma(x),
      \( [y: \text{car}(y), x \text{ bought } y], \)
      \( [z, y: \text{car}(y), x \text{ bought } y, \text{VW}(z), z = y] \)

(31) Wilma may have bought a car, *Fred can drive it, too.
The Boundaries of Modal Subordination -- and of Geurts’ Account?

- Wide empirical coverage can be achieved with the help of modal subordination, but, as Roberts herself points out, not a complete one.

5. Each degree candidate walked to the stage. He took his diploma from the dean and returned to his seat.

6. Each student in the syntax class was accused of cheating on the exam, and he was reprimanded by the dean.

7. Each student in the syntax class was accused of cheating on the exam, and he has a Ph.D. in astrophysics.

12. I was at a wedding last week.

12.1. The bride was pregnant.

12.2. The mock turtle soup was a dream.
Coherence to the Rescue!

- The crucial difference between (6) and (7) lies in the coherence of the respective discourses!
- The quantifier each in (6-7) seems to enforce a distributive reading.
- ‘one by one, every single syntax-student was accused of cheating, and was reprimanded by the dean’ vs ??‘one by one, every single syntax-student was accused of cheating, and has/had a Ph.D. in astrophysics’
- Perhaps Roberts had a similar intuition in mind when writing that the (in)felicitous use of the pronouns in (6) and (7) “depends in part on the plausibility of some sort of narrative continuity between the utterances of the discourse.” (Roberts 1989:717)

Kehler’s Discourse Coherence Relations

- “[C]oherence is defined in terms of the underlying semantic relationships that characterize and structure the transitions between utterances.” (Kehler 2011:1963)
- Kehler suggests a three-way categorization of coherence relations following David Hume’s three types of ‘connections among ideas’ (1748, An Inquiry Concerning Human Understanding).
  - Resemblance, Cause-Effect, Contiguity
- “Hume’s categories comprise a small set of basic types of cognitive principles that, when applied to the domain of discourse interpretation, give rise to [coherence] relations.” (Kehler 2002:4)
Establishing Cause-Effect

13. The city council denied the demonstrators a permit because
   13.1. they feared violence.
   13.2. they advocated violence.

- \text{fear}(X,V) \land \text{advocate}(Y,V) \land \text{enable_to_cause}(Z,Y,V) \supset \text{deny}(X,Y,Z)
- \text{deny(city\_council, demonstrators, permit)}
- \text{fear(city\_council,V) \land advocate(demonstrators,V) \land enable_to_cause(permit,demonstrators,V)}
- “the referent for the pronoun must be in focus at or soon after the time at which it is encountered” (2002:163)

14. The city council denied the demonstrators a permit because they decided that the best way to draw attention to issues is to advocate violence.

Another Example


- “As predicted by the analysis, the preferred referent of the pronoun depends directly on which of these coherence relation is inferred [here, either Parallel or Result].” (Kehler 2002:165f.)
- Parallel relation: pronoun is interpreted as referring to its parallel element (i.e., Cheney).
- Result relation: in accordance with world knowledge about defying and punishing, Powell is selected as the pronoun’s referent.
Coherence and Donkey Anaphora

16. Each student in the syntax class was accused of cheating on the exam, and he was reprimanded by the dean.

- Result: Infer \( P \) from the assertion of \( S_1 \) and \( Q \) from the assertion of \( S_2 \), where normally \( P \rightarrow Q \).

17. George is a politician, and therefore he’s dishonest.

18. # Each student in the syntax class was accused of cheating on the exam, and he has a Ph.D. in astrophysics.

- Not clear which relation should hold between the two clauses.

Kehler’s Coherence Relations - Overview

<table>
<thead>
<tr>
<th>Relation</th>
<th>Constraints</th>
<th>Conjunctions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallel</td>
<td>( p(p_1) ) and ( p(p_2) ), ( q_i(a_i) ) and ( q_i(b_i) )</td>
<td>and</td>
</tr>
<tr>
<td>Contrast</td>
<td>( p(p_1) ) and ( \neg p(p_2) ), ( q_i(a_i) ) and ( q_i(b_i) )</td>
<td>but</td>
</tr>
<tr>
<td>Exemplification</td>
<td>( p(p_1) ) and ( p(p_2) ) ; ( q_i(a_i) \subset q_i(b_i) )</td>
<td>for example</td>
</tr>
<tr>
<td>Generalization</td>
<td>( p(p_1) ) and ( p(p_2) ) ; ( q_i(b_i) \subset q_i(a_i) )</td>
<td>in general</td>
</tr>
<tr>
<td>Exception</td>
<td>( p(p_1) ) and ( \neg p(p_2) ) ; ( q_i(a_i) \subset q_i(b_i) )</td>
<td>however</td>
</tr>
<tr>
<td></td>
<td>( p(p_1) ) and ( \neg p(p_2) ) ; ( q_i(b_i) \subset q_i(a_i) )</td>
<td>nonetheless</td>
</tr>
<tr>
<td>Elaboration</td>
<td>( p_1 = p_2 ), ( a_i = b_i )</td>
<td>that is</td>
</tr>
</tbody>
</table>

**TABLE 1** Resemblance Relations

<table>
<thead>
<tr>
<th>Relation</th>
<th>Presuppose</th>
<th>Conjunctions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Result</td>
<td>( P \rightarrow Q )</td>
<td>and (as a result) therefore</td>
</tr>
<tr>
<td>Explanation</td>
<td>( Q \rightarrow P )</td>
<td>because</td>
</tr>
<tr>
<td>Violated Expectation</td>
<td>( P \rightarrow \neg Q )</td>
<td>but</td>
</tr>
<tr>
<td>Denial of Preventer</td>
<td>( Q \rightarrow \neg P )</td>
<td>even though despite</td>
</tr>
</tbody>
</table>

**TABLE 2** Cause-Effect Relations
Coherence and Donkey Anaphora

19. If John bought a book, he'll be home reading it by now.

19.1. #It's a murder mystery.

19.2. It'll be a murder mystery. / It's probably a murder mystery.

• Elaboration: Infer \( p(a_1, a_2, \ldots) \) from the assertions of \( S_1 \) and \( S_2 \).

• “the Elaboration relation can be seen as a limiting case of the Parallel relation, in which the parallel entities \( a_1 \) and \( b_1 \) are in fact identical.” (Kehler 2002:18)

• Parallel: Infer \( p(a_1, a_2, \ldots) \) from the assertion of \( S_1 \) and \( p(b_1, b_2, \ldots) \) from the assertion of \( S_2 \), where for some property vector \( q, q_i(a_i) \) and \( q_i(b_i) \) for all \( i \).


21. If a farmer owns a donkey, he beats it.

21.1. Sometimes it / the donkey kicks him back.

21.2. #Sometimes it / the donkey looks at him.

• Occasion (ii): Infer a change of state for a system of entities from \( S_2 \), inferring the initial state for this system from \( S_1 \).

• “This category [i.e., Contiguity] is a bit murkier than the other two ... Occasion can be seen as a mechanism for communicating a complex situation in a multi-utterance discourse by using states of affairs as points of connection between partial descriptions of that situation.” (Kehler 2002:22)

22. George picked up the speech. He began to read.

• Another possibility:
  Result: Infer \( P \) from the assertion of \( S_1 \) and \( Q \) from the assertion of \( S_2 \), where normally \( P \rightarrow Q \).
Coherence and Donkey Anaphora

21. If a farmer owns a donkey, he beats it.

21.1. Sometimes it / the donkey kicks him back.

21.2. Sometimes it / the donkey looks at him.

- Occasion (ii): Infer a change of state for a system of entities from $S_2$, inferring the initial state for this system from $S_1$.
- Another possibility:
  
  Result: Infer $P$ from the assertion of $S_1$ and $Q$ from the assertion of $S_2$, where normally $P \rightarrow Q$.
- Note that the account sketched so far also explains the following contrast:

23. Fred beats his donkey Asinus. It kicks back.

24. Fred beats his donkey Asinus. It looks at him.

- A Result relation can easily be inferred for (23). The relation between the two sentences in (24) is less straightforward.

Summary and Open Questions

- Coherence-relation-based framework seems well suited to account for the fact that anaphora to donkey pronouns is possible in some, but not in other, structurally similar cases.
- Such an approach can account for anaphora beyond donkey sentences, as well as for both classical modal subordination and telescoping sentences.
- Note that theories such as DRT are concerned with structural constraints on reference resolution, while Kehler is not concentrating on such constraints.
- Further research might help determine which properties of “reference phenomena” are of a structural nature and which ones are not.
- Can we extend this kind of approach to other cases of semantically bound pronouns that are not syntactically bound?
- What is the relation / what are the correspondences between coherence relations on the one hand and a QUD analysis on the other?
- As Kehler (2011:1982f) points out, certain (sets of) QUDs can be straightforwardly related to particular coherence relations (e.g., where/when/how? vs Elaboration)
Thank you!

References