1 Elementary DRT

Consider the following text T_1:

Mary knows a professor. He recommends a book. She reads it.

1. Derive a DRS K_1 for the text T_1 using the DRS construction algorithm from the lecture. You don’t have to spell out every single step of the derivation, but do show some of them.
2. Determine the truth conditions of K_1.
3. Although the text T_1 introduces several discourse referents that are available for anaphoric reference, the pronouns can’t refer to all antecedents due to their genders. Specify this restriction informally. Then show how it be incorporated into the DRS representations and construction rules.
4. Optional: English is different from German in that nouns in German have a grammatical gender (which can differ from the natural gender), and a pronoun must agree with the grammatical gender of the antecedent. Discuss the implications of this fact for DRS representations and construction rules, and try to give rules that take this situation into account.

2 Complex Conditions

Consider the following text T_2:

Mary knows a professor. If he writes a book, she doesn’t read it.

1. Derive a DRS K_2 for the text T_2 using the DRS construction algorithm. You don’t have to spell out every single step of the derivation, but do show some of them.
2. Determine the truth conditions of K_2.
3. Try to express the truth conditions (as requirements towards the model structure) in natural language as simply as possible.
4. Translate K_2 into a formula of first-order predicate logic.

3 Free Discourse Referents

Consider the DRSs K_3 and K_4 for texts T_3 and T_4, respectively.

T_3 *There is a book which Peter does not own.*

K_3 $\langle\{x, y\}, \{x = \text{Peter}, \text{book}(y), \neg\langle\{\emptyset\}, \{\text{own}(x, y)\}\rangle\}\rangle$

T_4 *Peter does not own every book.*

K_4 $\langle\{x\}, \{x = \text{Peter}, \neg\langle\{\emptyset\}, \{\langle\{y\}, \{\text{book}(y)\}\rangle \Rightarrow \langle\{\emptyset\}, \{\text{own}(x, y)\}\rangle\}\rangle\}\rangle$

1. Determine the truth conditions for the two DRSs and compare them.
2. If the two texts are continued by "He buys it," we obtain DRS K_3' and, if we ignore accessibilty restrictions, DRS K_4' in which DR y occurs free.

   K_3' $\langle\{x, y, u, v\}, \{x = \text{Peter}, \text{book}(y), \neg\langle\{\emptyset\}, \{\text{own}(x, y)\}\rangle, u = x, v = y, \text{buy}(u, v)\}\rangle$

   K_4' $\langle\{x, u, v\}, \{x = \text{Peter}, \neg\langle\{\emptyset\}, \{\langle\{y\}, \{\text{book}(y)\}\rangle \Rightarrow \langle\{\emptyset\}, \{\text{own}(x, y)\}\rangle\}\rangle, u = x, v = y, \text{buy}(u, v)\}\rangle$

   Determine the truth conditions of K_3' and K_4'.
3. Translate K_4' into predicate logic by using the rules from the lecture, and determine the truth conditions of the resulting first order formula. Compare the results with the truth conditions you derived for DRS K_4' above.

4 Mathematical Texts

Consider the following text T_5, which is a theorem of elementary geometry:

> *Given a line* g_1 *and a line* g_2*, let* p *be a common point of* g_1 *and* g_2*. Then there is a line* k *which is orthogonal neither to* g_1 *nor* g_2*, and which doesn't go through* p*.*

1. Give a DRS K_5 which represents the semantic structure of T_5. You can write down K_5 directly; it doesn't have to be generated by applying a construction algorithm. Analyse "line" as one-place, "orthogonal to" and "go through" as two-place, and "common point of" as three-place predicates. "Given" and "let" are cues for the discourse structure and don't occur in the DRS as predicates.
2. Try to extend the syntax and the DRS construction rules with rules for NPs like "a line g_1" and anaphora like "g_1". How could the DRS construction algorithm be modified to analyse texts with such NPs?

To be turned in by Tuesday, June 19, 11:15