

### 3.6 Modal Subordination

A certain set of problematic cases for the DRT accessibility condition is illustrated with examples like the following ones ((a) goes back to Karttunen 1976, the others are by Sell 1985 and Roberts 1987):

- (40)
- a. Harvey courts a girl<sub>i</sub> at every convention. She<sub>i</sub> always comes to the banquet with him. The girl<sub>i</sub> is usually very pretty.
  - b. Every chess set comes with a spare pawn<sub>i</sub>. It<sub>i</sub> is taped to the top of the box.
  - c. Every rice-grower<sub>i</sub> owns a wooden cart<sub>j</sub>. He<sub>i</sub> uses it<sub>j</sub> when he<sub>i</sub> harvests the crop.
  - d. A train<sub>i</sub> leaves every hour for Boston. It<sub>i</sub> always stops in New Haven.
  - e. If John bought a book<sub>i</sub>, he'll be reading it<sub>i</sub> by now. It<sub>i</sub>'ll be a murder mystery.
  - g. A thief<sub>i</sub> might break into the house. He<sub>i</sub> would take all the silver.

The indicated anaphoric relationships should be impossible, following classical DRT. (For the last case, note that the first sentence contains a modal operator, *might*, which should create a separate DRS, similar to negation.

Articles that treat these cases:

Craige Roberts, 1987, Modal Subordination, Anaphora, and Distributivity, Ph.D. dissertation, University of Massachusetts at Amherst.

Craige Roberts, 1989, Modal Subordination and Pronominal Anaphora in Discourse, *Linguistics & Philosophy* 12.

- Peter Sells, 1985, Restrictive and Non-Restrictive Modification, CSLI report 85-28.
- What are the conditions under which the extraordinary anaphoric references are possible? Notice that the second clause contains a (possibly non-overt) quantificational operator, like a mood operator or a quantificational adverbial, that makes a sentence dependent on the previous sentence. Hence the term for this phenomenon, **modal subordination**.

- (41)
- a. \*If John bought a book<sub>i</sub>, he'll be reading it<sub>i</sub> by now. It<sub>i</sub> is a murder mystery.
  - b. \*A thief<sub>i</sub> might break into the house. He<sub>i</sub> took all the silver.
  - c. \*Every rice-grower<sub>i</sub> has a wooden cart<sub>j</sub>. He<sub>i</sub> used it<sub>j</sub> yesterday to harvest the crops.

Another condition is that pronouns that have object NP antecedents allow for modal subordination more easily than pronouns that have subject NP antecedents. This relates to the presentational function of object NPs: Object NPs are often used to introduce new discourse referents.

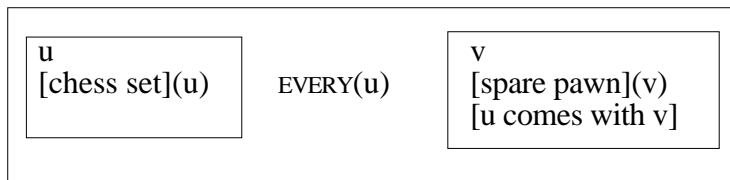
- (42)
- Every rice farmer<sub>i</sub> owns a wooden cart.
    - a) \*Usually, he<sub>i</sub> is poor.
    - b) Usually, it is a rickety old thing.
    - c) Usually, he keeps it in a barn.

We will only be concerned with the first condition here, the presence of a modal element. What seems to be going on is that the second sentence has to be interpreted with respect to an antecedent box that is constructed by the first sentence. Example:

- (43) Every chess set comes with a spare pawn. It is usually taped to the chess set.

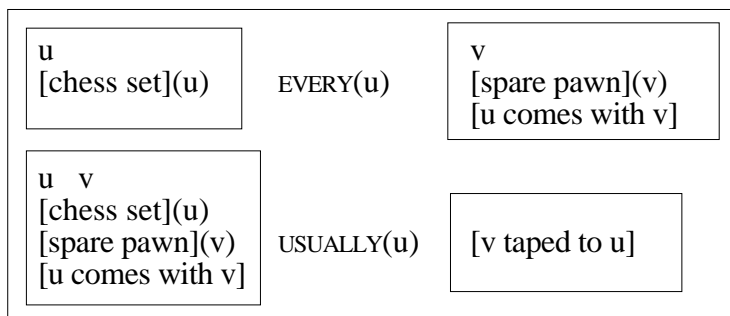
DRS before processing the second sentence:

(44)



The quantifier in the second sentence needs a restrictor (an antecedent DRS). The right semantic choice that will also provide for the antecedents for the anaphora is the conjunction of the previous antecedent and consequent box. Hence we extend the DRS as follows:

(45)

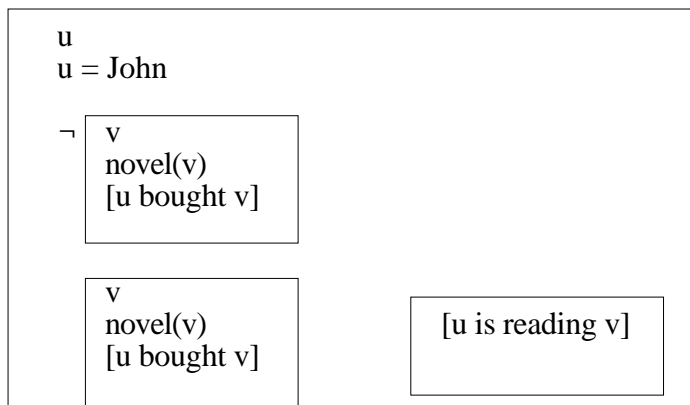


A case that involves a negated DRS:

(46) John didn't buy a mystery novel. He would be reading it by now.

We didn't treat modals like *would* so far, but observe that *would* expresses the consequent of a counterfactual conditional. The second sentence of (45) says: If John had bought a mystery novel, then he would be reading it by now. The apodosis of this sentence is not expressed overtly, but taken from the first sentence. We get the following analysis, which disregards tense and analyses the counterfactual simply as a universal quantifier.

(47)



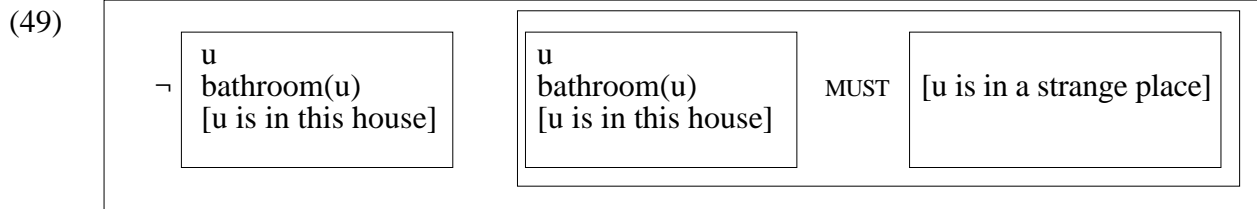
In general:

- whenever we have a sequence of two sentences  $S_i, S_j$ , where  $S_i$  and  $S_j$  both involve the introduction of new DRSs (through quantifiers or modal operators) and the two sentences “belong together” in the sense that  $S_j$  specifies some fact expressed by  $S_i$  further,
- and if  $S_i$  is represented by a condition  $K$  or a duplex condition  $K_1 Q K_2$ ,
- then  $K$  (or  $K_1 \quad K_2$ ) is added to the antecedent condition of  $S_j$ .

The following example (due to Barbara Partee) shows another example of modal subordination, this time related to disjunction:

(48) Either there is no bathroom in this house, or it is / must be in a strange place.

We might want to construct the following DRS (the definite NP *this house* is not reduced, for simplicity):



Here, MUST stands for a modal operator (roughly the same as EVERY). Which rule would allow us to construct this DRS for (49)? We get it from the rule above under the assumption that the two disjuncts “belong together”. Then DRSs constructed in the first disjunct can be taken as antecedent DRSs for quantificational DRSs in the second conjunct.

### 3.7 Definite Descriptions

Let us turn to definite descriptions, like *the donkey*. Recall that, after the theory of Russell (1905), sentences with definite descriptions express quantified statements with an existence condition and a uniqueness condition:

(50) The donkey is happy:  $x[\text{DONKEY}(x) \quad y[\text{DONKEY}(y) \quad x = y] \quad \text{HAPPY}(x)]$

There are various good arguments for Russell’s analysis. However, it seems problematic in cases like the following:

(51) Pedro owns a donkey and a goat. The donkey is happy.

It seems that in a context like (51), *the donkey* does not come with a uniqueness condition — there may be many donkeys in the model. Rather, *the donkey* acts like a type of pronoun — it picks up the discourse referent introduced by its antecedent, *a donkey*. This becomes particularly clear with examples like the following:

(52) Every farmer who owns a donkey and a goat likes the donkey and hates the goat.

In this case, typical models will have more than one farmers with a donkey and a goat, and hence the uniqueness condition that presumably come with *the donkey* and *the goat* cannot be satisfied!

Nevertheless, there seems to be something like a uniqueness condition even in these cases:

(53) Pedro owns a donkey, and Juan owns a donkey. The donkey is happy.

Clearly, this example is odd, presumably because there are two discourse referents, introduced by the two occurrences of *a donkey*, that are candidates to be the antecedent of *the donkey*. Hence definite NPs come with a uniqueness condition for most recently introduced discourse referents.

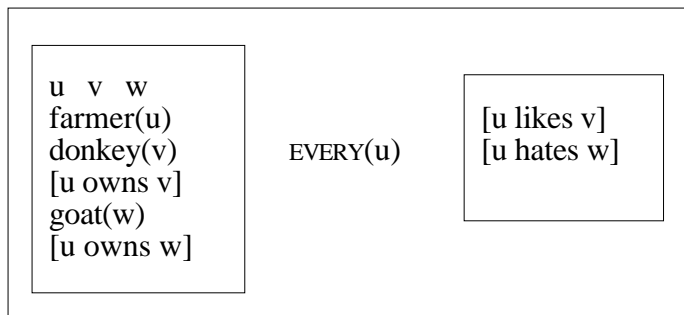
This suggests the following DRS construction rule:

#### CR.DEF:

- Triggering condition: [ $s$  [ $_{NP}$  *the N*] [ $_{VP}$  ]] or [ $_{VP}$  [ $_{NP}$  *the N*]], and there is a **unique** accessible discourse referent  $d$  such that  $N(d)$  is already established.
- Replace the triggering condition by [ $s$   $d$  [ $_{VP}$  ]] or [ $_{VP}$   $d$ ], respectively.

Example, assuming a plausible rule for NP conjunction and VP conjunction:

(54) Every farmer who owns a donkey and a goat likes the donkey and hates the goat.



But this is not the whole story. With anaphoric definites, the definite NP can introduce new information:

(55) Pedro owns a donkey. He beats the old, sick animal.

Also, there are definite NPs that are clearly non-anaphoric:

(56) Guess whom I met in Washington DC? The main speechwriter of the president!

Finally, definite NPs can refer to entities that conventionally come with other entities, a phenomenon called **bridging**:

(57) Pedro owns a car, but it does not work. The transmission is broken.

### Exercises:

6. a. Construct a DRS for the following text (notice: This text exhibits modal subordination!)

*Every farmer (of the village) owns a donkey. Usually, he likes it.*

b. Interpret this DRS w.r.t. the following model  $M = \langle U, F \rangle$ ,  
 where  $U = \{f1, f2, f3, f4, f5, d1, d2, d3, d4, d5\}$ ,  
 $F(\text{farmer}) = \{f1, f2, f3, f4, f5\}$ ,  $F(\text{donkey}) = \{d1, d2, d3, d4, d5\}$ ,  
 $F(\text{own}) = \{f1, d1, f2, d2, f3, d3, f4, d4, f5, d5\}$   
 $F(\text{like}) = \{f1, d1, f2, d2, f3, d3, f4, d4\}$ .  
 Interpret *usually* here like the quantifier *most*!

7. Formulate a DRS-construction rule that takes care for definite NPs that introduce new information, as in (55). Notice that it is unclear how we should interpret the text *Pedro owns a donkey and a horse. He beats the old, sick animal*. Your DRS-construction rule should reflect this problem.

8. Formulate a DRS-construction rule that takes care of the phenomenon of bridging, cf. example (57). Notice that the nouns in the definite descriptions can be understood as functional. For example, *transmission* can be interpreted as a function that, when applied to a car, gives us the transmission of the car.