Nonmaximality and Distributivity of Definite Plurals Using Decision Theoretic Semantics

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1 Decision Theory

- *Decision Theory* is a mathematical field that somewhat overlaps with game theory and deals with human decisions.
- Essentially, it provides the tools to model how humans make decisions and solve problems.

2 What is Decision Theoretic Semantics?

- *Decision Theoretic Semantics* (DTS) treats meaning using a pragmatic method rooted in understanding the goals of the communicators.
- That is, humans have problems they need to solve—*Decision Problems*—and they communicate to help solve those problems.
- DTS uses the knowledge of these goals to model the way humans ascribe meanings and resolve ambiguity.

3 Nonmaximality and Distributivity

- Take the following sentence:

  (1) The men slaughtered a goat.

- The predicate “slaughtered a goat” is distributive, meaning that each man partook of slaughtering a goat. This, however, is the *maximal* interpretation.
- “The men”, however, does not have to represent all of the men. Allowing for this leads to a *nonmaximal* interpretation.
- What this amounts to is that (1) is not necessarily equivalent to the following:

  (2) All the men slaughtered a goat.
4 The Cover Interpretation

▷ A cover is a set of sets dividing the world into sets. The cover is determined by “salience”.

– This is a “semantic” interpretation as opposed to a “pragmatic” one.

▷ The cover tells you how the plurals are “packaged”, and thus you know how to distribute the predicate over these packages (called cover cells).

▷ Let’s return to (1). Here’s what a cover can look like: \[
\{\{Allenby, Dawntry\}, \{Wooster, Cutler, Devanaughn\}, \{Matilda, Brunhilda, Susan\}, \ldots\}.
\]

▷ There are two interpretations for (1):

– (i) Wooster, Cutler, Devanaughn, Allenby, and Dawntry gathered around a goat to slaughter it, or
– (ii) Each of them had a goat which he slaughtered.

▷ Thus the covers could look like this:

– (i) \[
\{\{Allenby, Dawntry, Wooster, Cutler, Devanaughn\}, \{Matilda, Brunhilda, Susan\}, \ldots\}
\]

– (ii) \[
\{\{Allenby\}, \{Dawntry\}, \{Wooster\}, \{Cutler, Devanaughn\}, \{Matilda, Brunhilda, Susan\}, \ldots\}
\]

▷ Here’s another sentence:

(3) The goats are outside.

▷ This one can also have a set of interpretations:

– (i) All of the goats are outside, or (ii) only some of the goats are outside.

▷ What would the covers look like?

– (i) \[
\{\{Billy, Tommy, Tanya\}, \{Shepherd\}, \ldots\}
\]

– (ii) \[
\{\{Billy, Tommy\}, \{Tanya\}, \{Shepherd\}, \ldots\}
\]

5 Problems with Covers

▷ Requires at least the speaker to know the composition of cover-cells.

▷ That is, in (3) it would require knowing how and why the goats are distributed among the cover cells.
The mechanism for this is said to be “salience”. That is, it is a deictic reference to some actual division much like a pronoun refers to a person or a group.

This leaves out the method of resolving the vagueness in interpretation.

6 Decision Theoretic Semantics Interpretation

The arrangement of individuals is determined by relevance to solving a decision problem.

This requires understanding the scenarios.

For (3), lets say they are:

(i) The farm is on fire, and the goats are safe.
(ii) Someone left a gate open and some of the goats escaped.

In the case of the nonmaximal interpretation in (ii), it doesn’t matter exactly which goats are those that escaped. In fact, it’s very likely the speaker doesn’t even know which goats escape.

This means that a proper cover cannot be actually constructed—the partitioning of the world is highly uncertain in regards to the goats, and so you can’t rely on it to tell you which interpretation is the correct one.

The DTS interpretation instead examines the decision problems involved and the goals that result to resolve the meaning of the phrase:

(i) If the house is on fire, then you care about the safety of the goats (unless you were trying to burn them in the first place, which works out the same way). This yields (i).
(ii) If goats escaped, it doesn’t matter which goats. Even a single goat escapee will make the statement relevant to your problem. Thus, this yields (ii).

Scenarios for (1) can go as follows:

(i) The men are passing the initiation rites to a cult, and the cult leader is trying to determine whether:

(ii) The men can work together in a cultish singlemindedness and subservience.

(iii) The men have the stomach to kill a goat and thus participate in the cult’s rituals.

The case in (i) suggests that the men must have slaughtered the goat together while (ii) requires each to have slaughtered the goat separately.
Unless these goals are known, there is no way to create an appropriate cover here either.

Thus DTS allows deriving the correct meaning based on examining the goals of the communicating participants.

7 Conclusion

By examining the goals of conversing humans, DTS allows one to resolve ambiguities in distributivity and nonmaximality with definite plurals.

References


