Introduction to natural language semantics
Class 5: definite descriptions

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1 Introduction

- The only item in our fragment of English which remains to be interpreted is the definite article *the*.
- DPs headed by *the* are usually called *definite descriptions*. Since we have not talked about plurals, we focus here on singular definite descriptions such as (1).

  (1) the girl

- Let us consider:

  (2) The girl sleeps.

- Intuitively, in a situation where we have a single girl, and she sleeps, (2) is true. In a situation where we have a single girl, and she is awake, (2) is false.
- Bus what is the status of (2) when there is no girl, or multiple ones?

2 The quantificational analysis

- Russell (1905) famously proposed a theory of definite descriptions based on two assumptions:
  1. *the* should be analyzed on a par with, e.g, *every*, as a quantifying expression, i.e., as denoting a function taking two properties P, Q to a truth-value.
  2. The function expressed by *the* is the following:

$$f_{the}(P)(Q) = \begin{cases} 1 & \text{if } P \text{ is a singleton and } P \subseteq Q \\ 0 & \text{otherwise} \end{cases}$$

- In λ-calculus terminology, this gives the following treatment of *the*:

$$\textit{the} \rightsquigarrow \lambda P_{et}.\lambda Q_{et}.\exists x(Px \wedge \forall y(Py \rightarrow y = x) \wedge Qx)$$

- Given this entry, here is the derivation for (2):

  - S: $\exists x(Gx \wedge \forall y(Gy \rightarrow y = x) \wedge Sx) : t$
    - DP: $\lambda Q_{et}.\exists x(Gx \wedge \forall y(Gy \rightarrow y = x) \wedge Qx) : \langle et, t\rangle$
      - the: $\lambda P_{et}.\lambda Q_{et}.\exists x(Px \wedge \forall y(Py \rightarrow y = x) \wedge Qx)$ $: \langle et, \langle et, t\rangle\rangle$
      - girl: $G : et$
    - sleeps: $S : et$

- Here is the predicted semantic value for the sentence:

$$[\![(2)]\!]^{M,g} = \begin{cases} 1 & \text{if there is a unique girl and she sleeps} \\ 0 & \text{otherwise} \end{cases}$$

3 The referential analysis

- A different, and somewhat more natural, idea is that a definite description such as '*the girl*' denotes an individual—the unique object satisfying the predicate denoted by '*girl*'.

- This analysis goes back all the way to Frege:

> Let's start, e.g., with the expression 'the capital of the German Empire'. This obviously takes the place of a proper name, and has as its reference an object. (from *Function and Concept*, 1891)

- Frege referred to definite descriptions as 'compound proper names'.

- What about a situation in which there is no girl, or more than one?

- In this case, the definite description '*the girl*' will fail to denote an object. Its denotation is then undefined.

- Again, the idea that definite descriptions refer only when there is a unique instance of the relevant property can already be found in Frege:

> "The negative square root of 4". We have here a case in which out of a concept-expression, a compound proper name is formed, with the help of the definite article in the singular, which is at any rate permissible when one and only one object falls under the concept.
> (from *Über Sinn und Bedeutung*)

- How to represent this proposal in our λ-calculus framework?
- '*the girl*' should be translated to a term of type e, denoting an individual.
- But which term?
- We need to add a constructor ι to the lambda calculus.
  - Syntactic rule:
    - if $\varphi : t$ and $x \in \mathrm{Var}(e)$, then $\iota x.\varphi : e$
  - Semantic rule:
    - $[\![\iota x.\varphi]\!]^{M,g} = \begin{cases} \text{the unique } d \in D_e \text{ s.t. } [\![\varphi]\!]^{M,g[x\mapsto d]} = 1 & \text{if such a unique } d \text{ exists} \\ \text{undefined} & \text{otherwise} \end{cases}$
- Now the map $[\![\cdot]\!]^{M,g}$ from expressions of type τ to objects in D_τ is *partial*: for some expressions α, the value of $[\![\alpha]\!]^{M,g}$ is *undefined*; we abbreviate it as u.
- Admitting partiality requires some revision to the semantics of the λ-calculus. We need to say how undefinedness propagates to complex expressions. For instance:
  - The interpretation of a term of type $\langle \sigma, \tau \rangle$ is a *partial* function from D_σ to D_τ, i.e., a function which might be defined only on a subset of D_σ.
  - The interpretation of λ-abstractions will then be:
    - $[\![\lambda x_\sigma.\alpha]\!]^{M,g} =$ the partial function mapping each $d \in D_\sigma$ to $[\![\alpha]\!]^{M,g[x\mapsto d]}$.
  - Application needs to be revised as follows:
    - $[\![\alpha(\beta)]\!]^{M,g} = \begin{cases} [\![\alpha]\!]^{M,g}([\![\beta]\!]^{M,g}) & \text{if } [\![\alpha]\!]^{M,g} \text{ and } [\![\beta]\!]^{M,g} \text{ are defined} \\ & \text{and } [\![\beta]\!]^{M,g} \in \mathrm{Dom}([\![\alpha]\!]^{M,g}) \\ u & \text{otherwise} \end{cases}$
  - Other semantic clauses also need to be edited, including the ones for logical operators, which amounts to choosing a three-valued logic. But I will set this aside for now.
- Under this view, the translation of the definite article will then be:
  - *the* $\rightsquigarrow$ $\lambda P_{et}.\iota x.P(x) : \langle et, e \rangle$
- Here is the corresponding derivation for (2), 'the girl sleeps':

- S: $S(\iota x.Gx) : t$
  - DP: $\iota x.Gx : e$
    - the: $\lambda P_{et}.\iota x.P(x) : \langle et, e \rangle$
    - girl: $G : et$
  - sleeps: $S : et$

- Here is the predicted semantic value of the sentence:

$$[\![(2)]\!]^{M,g} = \begin{cases} 1 & \text{if there is a unique girl and she sleeps} \\ 0 & \text{if there is a unique girl and she's awake} \\ u & \text{if there is no girl, or several ones} \end{cases}$$

4 Comparing the two approaches

- The two approaches agree that (2) is true if and only if in the given context there is a unique girl and she sleeps.
- They also agree that that (2) is false if in the context there is a unique girl and she's awake.
- But they disagree about the status of (2) when there is no unique girl:
  - according to the quantificational approach, the sentence is false;
  - according to the individual-denoting approach, it has no truth-value.
- Which theory agrees better with truth-value intuitions? Evidence seems mixed:

(3) The student in this room is German. naturally judged as undefined

(4) Russell had dinner with the king of France. naturally judged false

- However, several indirect considerations favor the ι-approach. I will mention two.

4.1 Embedding in various environments

4.1.1 Questions

- Observation (cf. Rothschild 2007):

(5) Is the girl sleeping?
  a. Yes $\rightsquigarrow$ the girl is sleeping
  b. No $\rightsquigarrow$ the girl is awake

- This is predicted if (5) is a question about the truth-value of $S(\iota x.Gx)$
  - yes $\rightsquigarrow$ truth-value is 1 $\rightsquigarrow$ the girl is sleeping
  - no $\rightsquigarrow$ truth-value is 0 $\rightsquigarrow$ the girl is awake
- If (5) asks for the truth-value of $\exists x(Gx \wedge \forall y(Gy \rightarrow y = x) \wedge Sx)$, it is predicted to be equivalent with:

(6) Is it the case that there is a unique girl and that she sleeps?

- This seems wrong: someone asking (5) is not asking about the existence/uniqueness of girls.

- Also, that would predict that:
  - *no* $\rightsquigarrow$ either there is no unique girl, or the unique girl is awake.
- So the individual-denoting analysis fares better in combination with plausible assumptions about polar questions.

4.1.2 Quantifiers

- Consider a definite description embedded under a quantifier, as in (7):

(7) No girl kissed the boy she liked.

- Under the quantificational analysis, the sentence gets the following analysis:
  - (7) $\rightsquigarrow$ $\neg\exists x(Gx \wedge \exists y(By \wedge Lyx \wedge \forall z(Bz \wedge Lzx \rightarrow z = y) \wedge Kyx))$
- In words, this can be rendered by (8):

(8) No girl is such that she liked exactly one boy and kissed that boy.

- Then (7) would be predicted true, e.g., if every girl liked two or more boys (regardless of the kissing that took place).
- This seems wrong.
- What (7) conveys is that every girl liked one boy, and failed to kiss that boy.
- Under the individual-denoting analysis we get the translation:
  - (7) $\rightsquigarrow$ $\neg\exists x(Gx \wedge K(\iota y.Lyx)(x))$
- In combination with a natural clause for $\exists$, this predicts the following reasonable truth-conditions:

$$\begin{cases} 1 & \text{if every girl liked a unique boy and did not kiss that boy} \\ 0 & \text{if every girl liked a unique boy and some girl kissed that boy} \\ u & \text{if some girl liked no boy or several boys} \end{cases}$$

- Yet more examples can be produced by embedding definite descriptions in a range of linguistic environments, e.g., modals:

(9) a. It is possible that Alice's dog is a beagle.
b. $\not\equiv$ It is possible that Alice has a unique dog, and that dog is a beagle.

- All these embeddings reveal that the existence and uniqueness of an individual with the relevant property is not part of the content targeted by the operator.

4.2 Pragmatics

- Compare the following sentences (from Heim and Kratzer's textbook):

(10) a. Bob was absent again today.
  b. Today is not the first time that Bob is absent.
  c. Bob was absent today, and that has happened before.

- All of them seem true in the same situations, but they are appropriate in different circumstances:
  - (10-a): adressee knows about Bob's past absences, not about the current one.
  - (10-b): addressee knows about the current absence, not about the past ones.
  - (10-c): addressee knows neither.
- Why is that?
- To explain this, we make a distinction between information *presupposed* and information *asserted* by uttering a sentence.

	B absent today	B absent before
(10-a)	asserted	presupposed
(10-b)	presupposed	asserted
(10-c)	asserted	asserted

- Pragmatic rule (first approximation): information presupposed should be available to the adressee, while information asserted should be new.
- This predicts the observations above; but how to capture the required distinction formally?
- A theory where sentences can have undefined truth-value provides a natural way.
- We can assume that, in asserting a statement φ, a speaker:
  - presupposes that φ has a defined truth-value;
  - asserts that this truth-value is 1.
- Now back to definite descriptions.
- Under the individual-denoting analysis, a sentence 'the tall girl is sleeping':
  - presupposes that there is a unique tall girl;
  - asserts that she is sleeping.
- This allows us to explain important observations about the way definite descriptions are used in communication.

- E.g., imagine that only one student turned up at the exam.

(11) Context: addressee is aware that only one student turned up.
  a. The student who turned up got a good grade.
  b. #Only one student turned up at the exam; she got a good grade.

(12) Context: addressee is not aware of who turned up.
  a. #The student who turned up got a good grade.
  b. Only one student turned up at the exam; she got a good grade.

- Another example:

(13) Context: teaching addressing kids with no notion of geography.
  a. #The large desert in North Africa is called the Sahara.
  b. In North Africa there is a large desert, which is called the Sahara.

- On the quantificational analysis of definite descriptions, it is not clear how to account for these contrasts, since the two sentences are semantically equivalent.

- More generally, it is not clear how to distinguish presupposed content from asserted content.

5 Puzzles and loose ends

5.1 Semantic value and truth-value judgments

- If sentences lack a truth-value when a definite description is undefined, then why are they sometimes perceived as false?

(14) Russell had dinner with the king of France.

- We must allow for a more complex relation between semantic values and intuitions:
  - 1 $\rightsquigarrow$ true
  - 0 $\rightsquigarrow$ false
  - u $\rightsquigarrow$ undefined/false

- What determines whether something which is semantically undefined is perceived as false or neither true nor false?

- See von Fintel (2004) for discussion.

5.2 Weak definites

- Sometimes definite descriptions are used even when the relevant property is clearly satisfied by multiple individuals.
- Although rooms have four corners and trucks have two sides, we do say:

(15) Alice was sitting in the corner of the room.

(16) Alice was leaning against the side of a truck.

- But again, this is not always possible. E.g., if no country is uniquely salient in the context, the following is odd:

(17) #Alice visited the Asian country.

- There is significant literature on weak definites—ask me if you are interested.

5.3 Accommodation

- The requirement that a presupposition be shared in the context of utterance is a bit too strong.
- Example: suppose you don't know I have a sister. We are talking about Rome. I say:

(18) My sister lives there.

- This utterance is perfectly ok. You will simply assume that I am properly using the definite description, and therefore you will infer that I have a sister, and the definite description refers to them.
- This process is known as *presupposition accommodation*.
- However, accommodation too is not always possible. E.g., suppose out of the blue I utter:

(19) My sister lives in Rome too.

- In principle, you should be able to accommodate easily the presupposition that someone else besides my sister lives in Rome. But the sentence still sounds odd if no one else was mentioned in the conversation.
- When exactly can presupposition accommodation occur? How do hearers decide which information to accommodate?
- For discussion of presupposition accommodation, see Karttunen (1974); Lewis (1979); Beaver (1999); von Fintel (2008).

References

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