SPR 4106 Syntax and semantics in formal terms

Chapter 6 "Quantifiers": 5 Essentials

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April 16, 2015

Quantificational DPs denote sets of sets of individuals

- For example (ignoring singular/plural difference):

  $[\![\,\text{most students}\,]\!]_s =$

  $\{[\![\,\text{women}\,]\!]_s, [\![\,\text{diligent}\,]\!]_s, [\![\,\text{procrastinate}\,]\!]_s, \ldots\}$

Quantificational determiners denote relations between such sets

- For example: $[\![\,\text{most}\,]\!]_s = \{\langle X, Y\rangle : \text{most } X \text{ are } Y\}$
- Composition Principle: **generalized plugging in**:

  $[\![\,\text{a} + \text{b}\,]\!]_s = [\![\,\text{a}\,]\!]_s * [\![\,\text{b}\,]\!]_s = \{z : \langle [\![\,\text{b}\,]\!]_s, z\rangle \in [\![\,\text{a}\,]\!]_s\}$

  if a denotes a relation between two individuals **or two sets**

Referential terms are also DPs – can they also denote sets of sets?

Yes they can: if their extensions are 'lifted' –
from the individuals themselves to the sets of sets containing them

Beside the name extension (i) we can define the DP extension (ii):

(i) $[\![\,\text{Emilia}\,]\!]_s = e$

(ii) $[\![\,\text{Emilia}\,]\!]_s^{DP} = \text{LIFT}([\![\,\text{Emilia}\,]\!]_s) = \{\,X : e \in X\,\}$

The result is the same:

$[\![\,\text{Emilia rules}\,]\!]_s = 1$ if and only if

$[\![\,\text{rules}\,]\!]_s \in \{\,X : e \in X\,\}$ iff

$e \in [\![\,\text{rules}\,]\!]_s$

Generalizing and simplifying the composition principles:

$$[\![\mathrm{a} + \mathrm{b}]\!]_s =$$

$$\begin{cases} [\![\mathrm{b}]\!]_s([\![\mathrm{a}]\!]_s) & \text{if } [\![\mathrm{a}]\!]_s \text{ is type } x \text{ and } [\![\mathrm{b}]\!]_s \text{ is type } \langle x, y \rangle \\ [\![\mathrm{a}]\!]_s \cap [\![\mathrm{b}]\!]_s & \text{if } [\![\mathrm{a}]\!]_s \text{ and } [\![\mathrm{b}]\!]_s \text{ are type } \langle x, t \rangle \end{cases}$$

for any x and y, in particular, $x = e$ or $\langle e, t \rangle$ and $y = t$

- Just two principles: function application and intersection
- Equivalence between **set** and its **characteristic function**
- Function application **subsumes plugging in**: equivalence
  - between extension as a set of pairs $\langle u, v \rangle$ and
  - extension as a function from u to a set of v

Quantificational DPs in Object Position: Quantifier Raising (QR)

A **transitive verb** denotes a relation between individuals (or equivalently a function from individuals to sets of individuals)

A **quantifying DP** denotes a set of sets of individuals

Composing a type $\langle e, \langle e, t\rangle\rangle$ extension and a type $\langle\langle e, t\rangle, t\rangle$ extension would require a separate composition principle after all,

unless . . .

- we use Quantifier Raising (QR), a covert movement operation
- $[\![\, [\,\text{both shoes}\,]_i \text{ I like } t_i \,]\!]_s = \{\, x : I\ like_s\ x \,\} \in [\![\, \text{both shoes} \,]\!]_s$

Copula Verb *be* and Indefinite Article *a*

Indefinites are usually assumed to denote existential quantifiers:

$$[\![\,\text{a mitten}\,]\!]_s = \{\, X : X \cap [\![\,\text{mitten}\,]\!]_s \neq \emptyset \,\}$$

And the copula *be* can be assumed to denote identity:

$$[\![\,\text{the winner is Estonia}\,]\!]_s = 1 \text{ iff } [\![\,\text{the winner}\,]\!]_s \in \{\, x : x = e \,\}$$

Cases like (1) **can** be derived by combining these two assumptions:

(1) Scrooge is a miser.

But the right result can also be obtained by ignoring both *is* and *a*:

$$[\![\,\text{Scrooge (is a) miser}\,]\!]_s = [\![\,\text{miser}\,]\!]_s(s)$$