Quantification

1 Reminder: Final papers

Due Friday, November 11. "Should be approximately 10 pages. The paper should identify an original puzzle, in a language you speak or in another language by working with a native speaker consultant. Use the skills developed in class to carefully diagnose and describe the issue, and sketch a possible solution."

Advice for finding a topic: Look around your language for functional morphology or constructions whose meanings are not immediately obvious. What is the contribution of this morpheme? (Is it an entailment or presupposition?) Using the Principle of Compositionality and reasonable syntactic assumptions, figure out what its semantic contribution is.

A sample outline:

1. Introduction: I am studying X and I will propose that it means X.
2. Some basic data: Comparing minimal pairs of sentences with X and without X, we see that X must contribute meaning Y. X is grammatical in these sentences but not those others. A generalization for X's meaning and/or distribution is Z.
3. Proposal: I propose X's denotation is $[\![X]\!]$. Here are trees and computations for a couple examples above, showing that my proposed denotation yields the desired meaning.
4. Conclusion / open questions / problems with this analysis

This is just one sample; your paper does not have to follow it closely.

Advice for writing: Follow the advice in this short set of guidelines to writing Linguistics papers: `https://mitcho.com/teaching/newmeyer1988.pdf`.

If you want to work on another language, through elicitation: I would suggest looking at expressions for universal quantifiers (*every student*), different forms of negation, or words like 'only,' 'also,' 'again.'

Talk to me or email me about your topic by October 20 and I can give you some comments and/or references.

2 Subject quantifiers

The DPs we have studied so far have generally been of type e. Let's now consider subject DPs like *everyone*, *no one*,[1] and *someone*.

(1) Everyone sleeps.

Option 1: Include "plurals" in D_e, including a symbol that refers to 'nothing,' ϵ. *Everyone* is type e, the sum of all individuals.

(2) a. $D_e = \left\{ \begin{array}{c} \epsilon\text{, John, Mary, Kara,} \\ \text{John + Mary, John + Kara, Mary + Kara,} \\ \text{John + Mary + Kara} \end{array} \right\}$

b. $[\![\text{everyone}]\!]$ = John + Mary + Kara (type e)

c. $[\![\text{everyone sleeps}]\!]$ = 1 iff (John + Mary + Kara) sleeps

This sort of works for *everyone*, but it does not work for *no one* and *someone*. Why?

Option 2: *Everyone* is not type e.

(3) a. $[\![\text{everyone}]\!] = \lambda Q_{\langle e,t\rangle}$. for all $x \in D_e$ [x is animate $\rightarrow Q(x) = 1$]

b. $[\![\text{everyone sleeps}]\!]$ = 1 iff for all $x \in D_e$ [x is animate $\rightarrow x$ sleeps]

Quantificational DPs are type $\langle\langle e, t\rangle, t\rangle$. In other words, they take the VP as their argument.

Exercise

(4) **Every** dog sleeps.

Recall from Handout 2 that we wrote meanings for quantificational determiners as relations between sets:

(5) **Quantificational determiners as set-relations, from Handout 2:**

a. *every/all*$(A)(B) = 1$ iff $A \subseteq B$

b. *a/some*$(A)(B) = 1$ iff $A \cap B \neq \emptyset$

c. *no*$(A)(B) = 1$ iff $A \cap B = \emptyset$

d. *two*$(A)(B) = 1$ iff $|A \cap B| = 2$

e. *more-than-two*$(A)(B) = 1$ iff $|A \cap B| > 2$

f. *most*$(A)(B) = 1$ iff $|A \cap B| > |A \setminus B|$

[1]Although we spell this as two words, "no one," we will treat it as one word, just like *nothing*.

Because we normally work with truth conditions and functions, not sets, we have to translate (5a) into non-set terms:

(6) $[\![\text{every dog sleeps}]\!] = \{x : x \text{ is a dog}\} \subseteq \{y : y \text{ sleeps}\}$

$$\Leftrightarrow \text{for all } z \in \{x : x \text{ is a dog}\}\ [z \in \{y : y \text{ sleeps}\}]$$

$$\Leftrightarrow \text{for all } z \in D_e\ [\ \underbrace{z \text{ is a dog}}_{\textit{every}\text{'s first argument}} \rightarrow \underbrace{z \text{ sleeps}}_{\textit{every}\text{'s second argument}}\ ]$$

(7) $[\![\text{every}]\!] = \lambda P_{\langle e,t\rangle}\ .\ \lambda Q_{\langle e,t\rangle}\ .\ \text{for all } z \in D_e[\text{if } P(z) = 1, \text{then } Q(z) = 1]$

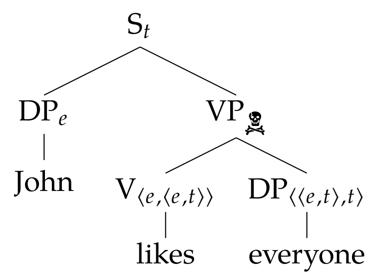
Exercise
Rewrite the quantificational determiners in (5) as λ functions of type $\langle\langle e,t\rangle,\langle\langle e,t\rangle,t\rangle\rangle$.

Some mathy notation you can use

- $\rightarrow$ *if...then...*
- $\forall$ *for all...*
- $\exists$ *there exists...*

3 Quantifiers in object position

(8) John likes everyone.



In order to avoid this problem, we're going to use a slight trick: to *move* the object:

(9) **The interpretation of movement:** (to be revised next week)
Pick an arbitrary variable, such as x.

a. The base position of movement is replaced with a *trace*; $[\![t]\!] = x$, type e.

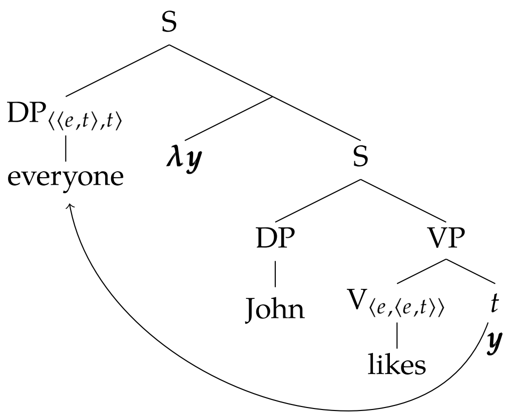
b. A *λ-binder* λx is adjoined right under the target position of the movement chain.

(10) **How to interpret λs in trees:** (also to be revised next week)

$$\left[\!\!\left[\ \lambda x \quad \ldots\ x\ \ldots\ \right]\!\!\right] = \lambda x\ .\ \ldots x \ldots$$

Now notice that objects of type $\langle\langle e,t\rangle,t\rangle$ can be interpreted easily if they are moved:

(11) Everyone, John likes ____.



Exercise: Make sure this works.

A solution to the problem of quantifiers in object position, like (8), is to *pretend this movement happened anyway*. The arrow is dashed because it's a *covert* movement, not reflected in pronunciation.

(12) LF for (8): everyone, John likes ____.

We call this movement *Quantifier Raising* (QR) (May, 1977). QR is required for quantifiers that are not in subject position, in order to avoid the type problem in (8).

References

May, Robert Carlen. 1977. The grammar of quantification. Doctoral Dissertation, Massachusetts Institute of Technology.