Meaning 5.2: Semantics 5 — Toy models; applications of what we've learned

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Recap

Model architecture: based on set theory.

Basic units: elements/individuals, ordered pairs, sets

TRUTH CONDITIONS

Operations/relationships: membership $\in$, intersection $\cap$, union $\cup$, subset $\subseteq$, superset $\supseteq$

COMPOSITIONALITY

Denotations we've covered so far

The following linguistic units are represented by these objects in our model:

(i) names, definite NPs (DPs) — elements/individuals $a, b, c, \ldots$

$[\![\text{Ted}]\!] = t$

(ii) nouns, adjectives, intransitive verbs — sets of individuals $A, B, C, \ldots$

$[\![\text{dance}]\!] = \{x\text{: } x \text{ dances}\}$

(iii) transitive verbs — sets of ordered pairs $\mathcal{A}, \mathcal{B}, \mathcal{C}, \ldots$

$[\![\text{like}]\!] = \{\langle x, y\rangle\text{: } y \text{ likes } x\}$

Compositions

(i) simple predication $S \to DP\ VP;\ VP \to V$ or $VP =$ *is* $+$ AdjP

S is true iff $[\![DP]\!] \in [\![VP]\!]$

(ii) transitive VP $S \to DP_1\ VP;\ VP \to V\ DP_2$

S is true iff $\langle [\![DP_2]\!], [\![DP_1]\!] \rangle \in [\![VP]\!]$

(iii) definite descriptors $DP \to D\ NP$

$[\![D\ NP]\!] =$ contextually salient individual d s.t. $d \in [\![NP]\!]$

Quantifiers

The quantification determiner used (*all, some, no,...*) determines the relevant relationship to check for the sets denoted by $[\![N]\!]$ and $[\![VP]\!]$

There is usually some domain restriction (determined by the context)

Simple predication is not used in this case of S $\rightarrow$ DP VP

(i) *All* N VP is true iff $[\![N]\!] \subseteq [\![VP]\!]$, such that $[\![N]\!]$ consists of the contextually salient individuals that have that property.

(ii) *Some* N VP is true iff $([\![N]\!] \cap [\![VP]\!]) \neq \varnothing$

(iii) *No* N VP is true iff $([\![N]\!] \cap [\![VP]\!]) = \varnothing$

Checking against a model

To see if our semantic theory is working, we can build a toy model to check our theory.

Our model has individuals, sets of individuals and sets of ordered pairs as its units, and the operations of $\cup, \cap$ and the relations $\in, \subseteq$.

We can build a hypothetical world w, and specify the individuals and sets in the world w, to check if our theories are producing the right predictions.

The idea here is that we don't **have** to precisely model the world at large to know something about language: all we need to do is model a context where we would know the behavior of language, and that is a much easier task. So, we typically just specify a 'toy model' to play around with and observe behavior. Ideally, the behavior of our model will reflect linguistic behavior.

A toy model

In the model world M, let's assume there are five individuals:

a: Aristotle c: Chomsky f: Frege
p: Plato r: Russell

And some of the predicates are as follows:

$$\text{philosopher: } \{a, f, p, r\}$$
$$\text{linguist: } \{c\}$$
$$\text{tall:}\{a, c, f\}$$
$$\text{know:}\{\langle a, p\rangle, \langle f, r\rangle, \langle r, f\rangle, \langle p, a\rangle, \langle r, c\rangle\}$$

Statements to check against this model

Let's start rattling off things we get from this model.

- Frege is a philosopher.

  $[\![\text{Frege is a philosopher}]\!] = \text{true iff } [\![\text{Frege}]\!] \in [\![\text{philosopher}]\!]$

  TRUE $\quad f \in \text{philosopher: } \{a, f, p, r\}$

- Russell is tall.

  $[\![\text{Russel is tall}]\!] = \text{true iff } [\![\text{Russel}]\!] \in [\![\text{tall}]\!]$

  FALSE $\quad r \notin \text{tall:}\{a, c, f\}$

- All linguists are philosophers.

  $[\![\text{All linguists are philosophers}]\!] = \text{true iff } [\![\text{linguists}]\!] \subseteq [\![\text{philosopher}]\!]$

  FALSE $\quad \text{linguist: } \{c\} \not\subseteq \text{philosopher: } \{a, f, p, r\}$

Statements to check against this model

- The linguist is a tall.

  $[\![\text{The linguist is tall}]\!] = \text{true iff } [\![\text{The linguist}]\!] \in [\![\text{tall}]\!]$

  TRUE $\qquad c \in \text{tall:}\{a, c, f\}$

- Plato knows is Aristotle.

  $[\![\text{Plato knows Aristotle}]\!] = \text{true iff } \langle [\![\text{Aristotle}]\!], [\![\text{Plato}]\!] \rangle \in [\![\text{know}]\!]$

  TRUE $\qquad \langle a, p \rangle \in \text{know:}\{\langle a, p \rangle, \langle f, r \rangle, \langle r, f \rangle, \langle p, a \rangle, \langle r, c \rangle\}$

- Some philosophers are tall.

  $[\![\text{Some philosophers are tall}]\!] = \text{true iff } [\![\text{philosopher}]\!] \cap [\![\text{tall}]\!] \neq \varnothing$

  TRUE

Some interesting cases

- The philosopher is a tall.

  $[\![\text{The philosopher is tall}]\!] = \text{true iff } [\![\text{The philosopher}]\!] \in [\![\text{tall}]\!]$

  TRUE?, FALSE?

  only defined if there is contextually salient individual in the set of philosophers ... presupposition.

- Everybody knows somebody.

  Everybody knows somebody = true iff (i) every person knows at least one person; (ii) there is at least one person that every other person knows.

  TRUE on (i), FALSE on (ii)

  scope ambiguity with quantifiers *every* and *some*; see colors on next slides.

Everybody knows somebody — reading (i), true

(i) Everybody knows somebody.

Everybody knows somebody = true iff every person knows at least one person

TRUE

Why? — For all y in the complete set of individuals in the world w, there is at least one x such that there is a pair $\langle x, y \rangle$ such that $\langle x, y \rangle \in$ know:$\{\langle a, p\rangle, \langle f, r\rangle, \langle r, f\rangle, \langle p, a\rangle, \langle r, c\rangle\}$

<u>Intuition</u>: are all the individuals in world w represented on the righthand side of the pairs $\langle \textit{left}, \textit{right} \rangle$ in $[\![\text{know}]\!]$?

Everybody knows somebody — reading (ii), false

(ii) Everybody knows somebody.

Everybody knows somebody = true iff there is at least one person that every other person knows.

FALSE

Why? — There is not one x such that for all y in the complete set of individuals in the world w, it is the case that there exists a pair $\langle x, y \rangle$ such that $\langle x, y \rangle \in$ know:$\{\langle a, p \rangle, \langle f, r \rangle, \langle r, f \rangle, \langle p, a \rangle, \langle r, c \rangle\}$

Intuition: Is there a lefthand element such that the pair $\langle \mathit{left}, \mathit{right} \rangle$ exists for all individuals y in the model world M when you substitute that individual in for the righthand element?

End of this video's material. End of semantics and my lecturing. Thank you *so* much for your attention and effort. Please stay safe and healthy — good luck and hope to see you around.

Cheers,

Brandon