

Introduction to Semantic Theory

Beyond extensionality

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Back to basics – I

The aim of formal semantics:

to build a formal system that models the **fundamental ability of humans to compose the meaning of complex expressions from the meaning of its parts.**

In this lecture, we have built a system that can provide step-by-step derivations of the truth conditions for **sentences of a certain kind** – sentences that express statements about one or more individuals or sets of individuals, the properties that they have, and the relations between them **at the moment of utterance in the world of utterance.**

Back to basics – II

The restriction to the **Here & Now** and the fact that we can only talk about individuals is a consequence of our choice:
⇒ to use extensions to model meaning
⇒ to build them by forming sets of (tuples) of individuals

- ▶ $\llbracket tree \rrbracket^w = \{x : x \text{ is a tree in } w\}$
- ▶ $\llbracket blue \rrbracket^w = \{x : x \text{ is blue in } w\}$
- ▶ $\llbracket snore \rrbracket^w = \{x : x \text{ is snoring in } w\}$

Aim for today

The aim for today: to discuss why the extensional system we have built does not suffice

- ⇒ We will discuss a list of observations on expressions that cannot be captured in our system.
- ⇒ The result will be to add new kinds of “things” to our system to be able to model the behavior of these expressions.

Observation 1: surprising pronouns

- (1) *Jones is buttering the toast. He does **it** with a knife, in the bathroom, at midnight.*
- (2) *Peter is tickling Mary. She likes **it**.*

What do the two occurrences of *it* refer to?

Eventualities

If we assume that pronouns can pick up referents of other expressions in the discourse context, then the two occurrences of *it* should also pick up the referent of some expression in the preceding sentences.

Claim: These occurrences of *it* pick up **eventualities** that were referred to in the previous sentences.

- (3) *Jones is buttering the toast.*
↪ talks about the eventuality of Jones buttering the toast

- (4) *Peter is tickling Mary*
↪ talks about the eventuality of Peter tickling Mary

Adding eventualities to the system – I

The set of all individuals is the discourse domain D_e . To that we add the set of all eventualities that are happening in the world:

- (5) D_v = the set of all eventualities = the domain of eventualities

The type of eventualities is v . This type is added as a basic type to the type inventory of the system.

Which lexical elements take eventualities as their arguments?

Adding eventualities to the system – II

The prototypical expressions that say something about eventualities are verbs.

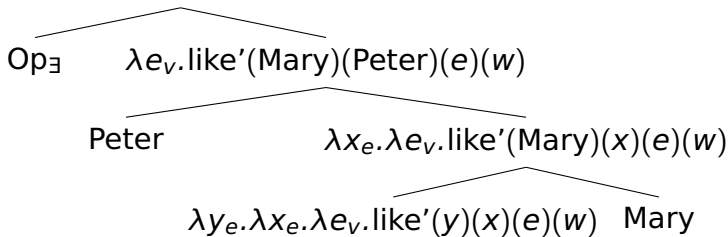
Verbs describe an eventuality and relates them to the individuals that participated in the eventuality.

Proposed change in the extensions of verbs:

- ▶ $[[snore]]^w = \lambda x_e. \lambda e_v. snore'(x)(e)(w)$
- ▶ $[[kiss]]^w = \lambda y_e. \lambda x_e. \lambda e_v. kiss'(y)(x)(e)(w)$
- ▶ $[[give]]^w = \lambda z_e. \lambda y_e. \lambda x_e. \lambda e_v. give'(z)(y)(x)(e)(w)$

Sample derivation

This is an updated version of the sample derivation I gave in the first lecture for '*Peter likes Mary*'.

$$\exists e[e \text{ in } w \ \& \ \text{like}'(\text{Mary})(\text{Peter})(e)(w)]$$


(Just a suggestive preview!)

Eventuality-sensitive expressions

Apart from verbs, are there other expressions for which eventualities are needed in the system?

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▶ Adverbs/adverbials:

(6) *Peter buttered the toast with a knife, in the bathroom, at midnight.*

▶ Event nouns:

- (7) a. *The match between Germany and France takes place tomorrow.*
b. *The lecture lasts forever.*

Observation 2: Tense makes a difference

This is not a particularly surprising observation about language, but tense marking affects the truth conditions of a sentence.

- (8)
- a. *Peter likes Mary.*
 - b. *Peter liked Mary.*
 - c. *Peter will like Mary.*

What is, intuitively, the difference in meaning between these three sentences?

Adding times to the system

As we did for eventualities above: to be able to talk about times and capture differences in sentences with different tense marking, we need to add another domain to our system.

(9) D_t = the set of all times = the domain of times

When we talk about anything in the past or the future, this is called **temporal displacement**.

Which expressions are sensitive to times?

Where we talk about time

- ▶ **Tense marking on the verb:** one way to think about tense marking in language is to assume that verbs enter syntactic derivations without any tense marking. The tense marking morphemes carry temporal meaning – they are the overt material brought in by the Fin head. Semantically, this can be translated into an operator that takes an untensed sentence as its argument and gives back a tensed sentence.

(10) *Peter kissed Mary.* ↗ [PAST](Peter kiss Mary)

- ▶ **Temporal adverbials:**

(11) *Peter is **always** late.*

Observation 3: sometimes the Here is not enough

- (12)
- a. *Peter is probably sick.*
 - b. *Mary has to do her homework.*
 - c. *Paul might be at home.*

What makes these sentences particularly challenging?

Modal displacement

Similarly to temporal displacement, where we talk about circumstances before or after the Now, we can express **modal displacement**.

Modal displacement occurs whenever we talk about permissions, obligations, and general hypotheticals. Sentences in which modal displacement occurs do not talk about the actual make-up of the Here (not even at different times).

- (13) *According to her mum, Mary has to clean her room each weekend. She never does.*

Capturing modal displacement

To capture modal displacement, we need to add another domain of alternatives to the Here. The Here and all of its alternatives make up the set of all **possible worlds**. The Here is usually called “**the actual world**”.

- (14) D_s = the set of all possible worlds = the domain of worlds

Which expressions convey something about worlds?

World-sensitive expressions

There are many world-sensitive expressions in natural language. An incomplete list:

▶ Modal auxiliaries:

(15) *Peter **must** not hear about his surprise party.*

▶ Modal adjectives and adverbs:

- (16) a. *It is **possible** that Peter will find out.*
b. *Mary will **probably** slip up.*

▶ Attitude verbs:

(17) *Paul **thinks** that Peter will love the party.*

A new research question

Having added three more domains to the system, one of the central questions that needs to be asked is:

Are there expressions that are sensitive to more than one of these domains? How are these domains linked?

⇒ This is one of the central questions of ongoing research in formal semantics.

Summary

- ▶ In this lecture, we have built a system that works very well for sentences that talk about the Here & Now.
- ▶ However, one characteristic feature of natural language is displacement; we are able to talk about circumstances other than the Here & Now.
- ▶ To capture sentences that feature displacement, we need to extend the system in various ways.
- ▶ **Exploring this new system is the topic of formal semantics as you will see in upcoming semantics seminars.**