

Introduction to Semantic Theory

Modelling the context: Pronouns

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Connecting back to the previous lecture

Central result: to account for attributive adjectives, we extended the formal system with the derivation rule (PM)

- ▶ We derived a proposal for the semantic type and the extension of the definite article.
- ▶ We discussed two possible solutions to the empirical problem provided by attributive adjectives. We discussed their consequences, and chose to introduce a new derivation rule – predicate modification (PM).

(1) **Predicate Modification (PM):**

For a branching node α with the set of daughters $\{\beta, \gamma\}$, where β and γ are of type $\langle e, t \rangle$, then $\llbracket \alpha \rrbracket^w = \lambda x_e. \llbracket \beta \rrbracket^w(x) \ \& \ \llbracket \gamma \rrbracket^w(x)$

Aim for today

The aim for today: to discuss expressions that heavily depend on context: **personal pronouns**.

- ⇒ Personal pronouns have variable interpretations. Their kind of variability cannot be captured by the inherently static extensions that we used before.
- ⇒ **Consequence**: extension of the system by formal means to capture the context dependence of personal pronouns.
- ⇒ **We will see**: third person and first/second person singular pronouns have different semantic behavior and need to be analyzed differently.
- ⇒ **Methodological lesson**: how to get a better picture of the semantic contribution of an expression α by contrasting and comparing it with (superficially) similar expressions.

Individual denoting expressions

We have seen two types of linguistic expressions that denote an individual:

- ▶ proper names
- ▶ definite descriptions (*the*+NP)

They have in common: they are expressions of type e

Their semantic difference lies in how the denotation to a specific individual is fixed.

Proper names vs. definite descriptions

Given the extensions we determined, what is the semantic difference between the two types of expressions?

- (2)
- a. $\llbracket \textit{Peter} \rrbracket^w = \textit{Peter}$
 - b. $\llbracket \textit{the boy} \rrbracket^w = \iota x[\textit{boy}'(x)(w)]$

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 b. $\llbracket \textit{the boy} \rrbracket^w = \iota x[\textit{boy}'(x)(w)]$

- ▶ For **proper names**, the individual that is denoted is fixed as part of their lexical entry.
- ▶ For **definite descriptions**, the individual that is denoted is fixed by the definite article on the basis of the extension of the noun and the context of utterance (this is done by the ι -operator).

Another class of expressions denoting individuals: pronouns

At first we will restrict ourselves to **third person singular pronouns**, *he*, *she*, *it* (and their case variants).

- (3) a. *Peter told Paul a story that he liked.*
 b. *Peter told Paul a story that Peter liked.*
 c. *Peter told Paul a story that Paul liked.*
- (4) *Peter told Paul a story that she liked.*

Describe what the examples in (3) and (4) show regarding the extensions of third person singular pronouns in contrast to proper names!

The three types of uses of 3rd sg pronouns

As examples (3) and (4) suggested, third person singular pronouns have **variable denotation**. They can denote varying individuals that fit their gender specification.

Three different uses are traditionally distinguished.

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(5) *John called. He'll drop by later.*

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- ▶ **Deictic (referential) pronouns:**

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- ▶ **Bound anaphoric pronouns:**

(7) *No actress resents her cat.*

How to model 3rd sg pronouns? – I

Until this point, we have only seen expressions that always contribute (qualitatively!) the same extension.

$$(8) \quad \llbracket tree \rrbracket^w = \lambda x_e. tree'(x)(w)$$

Even though the trees that are in this set vary depending on what the world w looks like, the noun *tree* always denotes the set of all trees in w (or the corresponding function).

The variable denotation of personal pronouns is conceptually different. The pronoun *he* does not always denote the same male individual in w – not even in a sequence of utterances.

$$(9) \quad \textit{Peter} \textit{ called. He'll drop by later to talk to Paul. He had asked for him.}$$

How to model 3rd sg pronouns? – II

Given the discussion above, can we assign an extension to third person singular pronouns in the same manner as we did for noun, verbs, etc?

How to model 3rd sg pronouns? – II

Given the discussion above, can we assign an extension to third person singular pronouns in the same manner as we did for noun, verbs, etc?

No, this is not possible. The variability just cannot be captured by the relative invariability of fixed extensions.

Goal: We need to **augment the model by something that can provide different individuals** as denotations of these pronouns.

Individuals provided by the (discourse) context

For the deictic and the referential anaphoric uses of third person singular pronouns, we can argue that the individuals are provided either by the utterance context (deictic use) or the previous discourse (anaphoric use).

- (10) a. [speaker points at John:] *He did it!*
 b. *John called. He'll drop by later.*

We need something that makes individuals from the utterance context accessible and that tracks individuals introduced in the previous discourse.

Idea: assignment functions – I

To make individuals from the utterance context accessible and to track individuals introduced in the previous discourse, we introduce **assignment functions** into the model.

- (11) An **assignment function** g is a function from indices to individuals. This means, it assigns to each index one and only one individual.
- (12) **Indices** are modelled by natural numbers (1, 2, 3, ...) that are assigned to expressions that denote individuals. In case two expressions share the same index, they denote the same individual.

John₁ called. He₁'ll drop by later.

Idea: assignment functions – II

The example illustrating the referential (anaphoric) use suggests that **proper names introduce conditions on the assignment function g** , and **pronouns access g to get their interpretation**.

To formalize this, we **add g to the interpretation function**. This is meant to say that any expression that accesses the assignment function, accesses this g .

$$(13) \quad \llbracket \text{Mary}_5 \rrbracket^{w,g} = \text{Mary}$$

[Condition on g : $g(5) = \text{Mary}$]

Idea: assignment functions – III

In the deictic use, the pointing gesture seems to fix an individual as the denotation of a pronoun.

To make this case parallel to the referential (anaphoric) case, we will still assume that the gesture places a restriction (like proper names) on the assignment function g for whichever index the pronoun carries.

(14) [speaker points at John:] *He₂ did it!*

The pointing introduces the following condition on g :
 $g(2) = \text{John}$

Interpreting pronouns

For the referential anaphoric pronouns and the deictic pronouns, we want that their denotation is the individual that the assignment function assigns to the index that the pronoun carries.

Mary₅ went to a party. She₅ had a good time.



Condition:
 $g(5) = \text{Mary}$



Assign:
 $g(5) = \text{Mary}$

Introducing a new rule

Since the contribution of pronouns is not fixed for w , but depends on the make-up of g , we cannot formulate the extension of a pronoun in the same manner as we did for all other lexical items before. In fact, the only way to formulate the variable interpretation is via an **interpretation rule**.

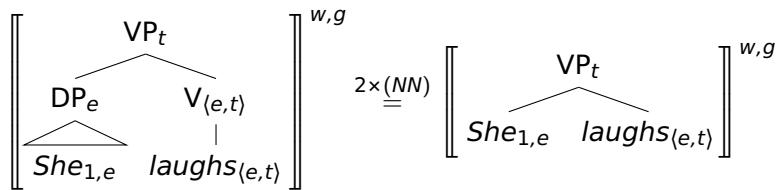
(15) **Pronouns Rule (PR):**

If α is a pronoun, then for any assignment g and index i for which g assigns a value: $\llbracket \alpha_i \rrbracket^{w,g} = g(i)$

Which type does the result of the new interpretation rule have? That is, what is ‘the type of pronouns’?

Sample derivation

Assume: a previous utterance established $g(1) = \text{Mary}$.



$$\stackrel{(FA)}{=} \llbracket \text{laughs} \rrbracket^{w,g} (\llbracket \text{she}_1 \rrbracket^{w,g})$$

$$\stackrel{(PR)}{=} [\lambda x. \text{laugh}'(x)(w)](g(1))$$

$$= [\lambda x. \text{laugh}'(x)(w)](\text{Mary})$$

$$\stackrel{\lambda}{=} 1 \text{ iff laugh}'(\text{Mary})(w)$$

What about the bound use of pronouns?

Before we can say anything substantial about this use, we need a hypothesis for the extension of quantifying expressions (→ later classes).

(16) *Every actress loves her cat.*

Intuitively, the interpretation of *her* in (16) seems to covary with the actresses that the quantifying expression varies over: each actress has a cat and she loves that cat.

Interim summary – I

- ▶ Like proper names and definite descriptions, third person singular pronouns denote individuals (type e).
- ▶ Third person singular pronouns do not have fixed extensions, though. Their denotations are determined via the **Pronouns Rule (PR)**:

(17) If α is a pronoun, then for any assignment g and index i for which g assigns a value: $\llbracket \alpha_i \rrbracket^{w,g} = g(i)$

- ▶ (PR) utilizes an assignment function g which stores individuals that are contextually given under different indices; it accesses g to pick out the interpretation of a pronoun.

Interim summary – II

Linking back to the classes on ambiguities:
based on how we model personal pronouns, how would we
formulate formally why for certain sentences referential
ambiguities arise?

(18) *Peter told Paul that he should call Mary.*

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formulate formally why for certain sentences referential
ambiguities arise?

(18) *Peter told Paul that he should call Mary.*

The referential ambiguities arise in case a referentially used
(anaphoric) pronoun, e.g., *he* in (18), can in principle be
co-indexed with more than one antecedent – above, either
Peter or *Paul*:

- (19) a. *Peter₁ told Paul₂ that he₁ should call Mary.*
b. *Peter₁ told Paul₂ that he₂ should call Mary.*

First and second person singular pronouns – I

First person singular (*I*) and second person singular (*you*) pronouns are **traditionally grouped with third person singular pronouns** (*he, she, it*) – and all plural personal pronouns (which we will ignore).

Given this grouping, the **obvious question** is:

Do first and second person singular pronouns behave semantically just like third person singular pronouns? And formally, can we account for their behavior with the same mechanisms that we introduced for third person singular pronouns?

First and second person singular pronouns – II

Consider the following examples containing first person singular (*I*) and second person singular (*you*) pronouns:

- (20) A: *What did you do last weekend?*
 B: *I was at the department and prepared my lecture for today.*
 A: *Really? I watched a lot of TV!*

Which use of third person singular pronouns shares a similar behavior to that of *I* and *you* in (20)?

Data comparison – I

Third person singular pronouns in their deictic use behave differently from first and second person singular pronouns: third person pronouns can be used anaphorically to **denote the same individual as another pronoun in a previous discourse turn.**

- (21) A: [points at Peter] *He was at the movies yesterday.*
 B: *Really? I thought he had the flu!*

Data comparison – I

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- (21) A: [points at Peter] *He was at the movies yesterday.*
B: *Really? I thought he had the flu!*
- (22) A: *I was at the movies yesterday.*
B: *#Really? I thought I had the flu!*
- (23) A: *Did you go to the movies yesterday?*
B: *#No, you had the flu.*

Data comparison – II

First and second person singular pronouns also behave differently from proper names and definite descriptions: they can also denote the same individual as another occurrence of the same expression in another person's utterance.

- (24) Peter: *Mary is nice.*
 A to B: *Peter said that Mary was nice.*
- (25) Peter: *The girl is nice.*
 A to B: *Peter said that the girl was nice.*

Data comparison – II

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A to B: *Peter said that Mary was nice.*
- (25) Peter: *The girl is nice.*
A to B: *Peter said that the girl was nice.*
- (26) Peter: *I'm nice.*
A to B: *#Peter said that I was nice.*

Differences: how the interpretation is fixed

- ▶ **Proper names:** stable, fixed denotation independent of the utterance context
- ▶ **Definite descriptions:** the individual that is denoted is stable in an utterance context
- ▶ **Third singular pronoun:** the individual that is denoted is stable in an utterance context (as long as the occurrences bear the same index and the assignment function is not changed)
- ▶ **First and second singular pronouns:** the individual that is denoted shifts with every discourse turn

First and second person singular and the utterance context

The interpretation of first person singular (*I*) and second person singular (*you*) is **intimately tied to the utterance context** since the individuals that are denoted shift at every turn – i.e., whenever the speaker changes.

In contrast to third person singular pronouns the shift/fixing of the individual is **automatic and does not depend on speaker intentions**:

- (27) A: [points at Peter] *He likes Mary.*
A': [points at Peter] *#I like Mary.*

Formalizing *I* and *you*

The formalization that we will adopt was proposed by Kaplan (1977), who introduced a **context parameter *c***:

- (28) ***c*** models the **immediate utterance context**; it provides the speaker, addressee, time, and place of the current utterance

Formalizing *I* and *you*

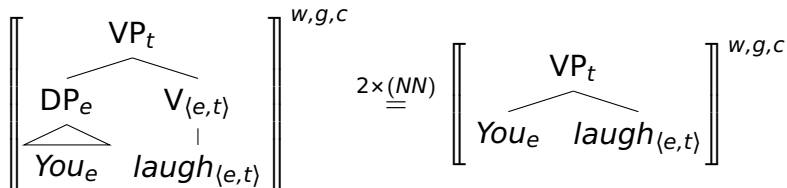
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First and second person pronouns **access the context parameter** to fix their interpretation on an individual. In updated notation:

- (29) a. $\llbracket I \rrbracket^{w,g,c} = \text{speaker}(c)$
 b. $\llbracket \text{you} \rrbracket^{w,g,c} = \text{addressee}(c)$

Sample derivation



$$\begin{aligned} & \stackrel{(FA)}{=} \llbracket \text{laugh} \rrbracket^{w,g,c} (\llbracket \text{you} \rrbracket^{w,g,c}) \\ & = [\lambda x. \text{laugh}'(x)(w)](\text{addressee}(c)) \\ & \stackrel{\lambda}{=} 1 \text{ iff } \text{laugh}'(\text{addressee}(c))(w) \end{aligned}$$

Summary

- ▶ The interpretation of 3rd sg pronouns is variable and – depending on the use – draws on the physical or the discourse context. In contrast, 1st and 2nd sg pronouns depend on the “immediate utterance context”.
- ▶ The variability is captured by having 3rd sg pronouns access an **assignment function** g that tracks individual that can be referred to.

(30) **Pronouns Rule (PR):**

If α is a pronoun, then for any assignment g and index i for which g assigns a value: $\llbracket \alpha_i \rrbracket^{w,g,c} = g(i)$

- ▶ 1st and 2nd singular pronouns access a **context parameter** c that encodes the current speaker and addressee.