Discourse Semantics

Yerevan Academy for Linguistics and Philosophy

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- This course is about semantics, the formal study of meaning
- Specifically, about anaphora and presupposition.
- If you don't know what these are, you are in the right place.
- The course is intended to introduce you to formal semantic methodology and introduce you to a very useful formalism.

- Nothing I say here is incontrovertible Truth.
- Please do not shut off your critical thinking: whenever I say something that makes you go “wait, really?” tell me! Quite possibly I’m wrong.
- Even better, try to find counterexamples (in many cases you will be able to find some).
- Tell me about your native languages!

A Narrative

The family of Dashwood had long been settled in Sussex. Their estate was large, and their residence was at Norland Park, in the centre of their property, where, for many generations, they had lived in so respectable a manner as to engage the general good opinion of their surrounding acquaintance. The late owner of this estate was a single man, who lived to a very advanced age, and who for many years of his life, had a constant companion and housekeeper in his sister. But her death, which happened ten years before his own, produced a great alteration in his home; for to supply her loss, he invited and received into his house the family of his nephew Mr. Henry Dashwood, the legal inheritor of the Norland estate, and the person to whom he intended to bequeath it. (Jane Austen, Sense and Sensibility)

Not A Narrative

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What are the parts?

And how do they combine?

And to what?

Fregean Semantics

1. You know the meaning of a sentence if you know what is required for the sentence to be true.

2. The meaning of a complex expression is determined by what its parts are and how they are combined.

Approaching Semantics

- The parts are predicates and referents in a formal logical language.
- These combine to form propositions: formal objects that have truth conditions.
- So we understand sentences, because
  - → We understand words.
  - → We understand how words fit together.
  - → We understand requirements for truth.

(1) Someone walks.

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That is:

- *someone* introduces some referent x
- *walks* is a predicate $\texttt{walk}(\_)$ where a referent fits in.
- The $\mathrm{NP}\ \mathrm{VP}$ syntax tells you to put the NP into the VP.

(2) Someone who walks is outside.

If you take a part out, you don’t understand anymore:

- “Someone who”
- “Someone who walks”
- “walks is outside”

(3) A wug is yoink.

- You don’t understand this expression, because you don’t know what is required for the expression to be true.
- You don’t know its parts.

(4) is walk someone.

- You don’t understand this expression because you don’t know what is required for the expression to be true.
- You know all the parts, but you don’t know how they compose.

Anaphora

- What about sentences like this:

(5) He walks.

- Or this

(6) Then someone walked.

- Or this

(7) So am I.

- Do you know what is required for these sentences to be true?

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such sentences are parts of bigger wholes

Like words compose to sentences, sentences compose to narratives.

Anaphora

- An expression whose meaning depends on a prior expression is called an anaphor.

(roughly)

(8) There is a man. He walks.

(9) Nobody was moving. Later, someone walked.

(10) Someone is upset. So am I.

Incoherence

- Call a narrative incoherent if you cannot understand it.
- More precise definitions of “incoherence” in due time.
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(11) There is nobody. ✗He walks.

- Note that order matters:

(12) A farmer owns a donkey. He beats it.
✗ He beats it. A farmer owns a donkey.

There are a lot of them!

- We saw pronominal anaphora (“he”), temporal anaphora (“later”), adjectival anaphora (“so”).
- Event anaphora:

(13) Tonkee hit Binof. It caused a fight.

- Propositional anaphora:

(14) Damaya believes it is raining. Essun doubts that.

- Type anaphora:

(15) Hoa gave a presentation. Jija gave one too.

… and they are not trivial

- You may now think:

  Say I have two sentences. I understand the truth-conditions of the first, but the second contains a "he". If the truth-conditions of the first are such that there is a male person in every situation where the sentence is true, then "he" refers to this person.

- If you think that, you are very very clever!

Not just truth-conditions

- But wrong.

(16) I have three siblings, two of whom are female.
My sisters are here. ✗He is somewhere else.

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- These are Partee sentences (for the great Barbara Partee).

- This is her example:

(17) Nine of my ten marbles are in the bag.
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- The Partee observation is *universal* to anaphora.

→ Try to find your own examples for other cases!

More like this

(18) There are some men. They walk.

- Double negation:

(19) There aren't no men. ✗They walk.

- Quantifier duality:

(20) It is not the case that everyone is not a man. ✗They walk.

There is only one conclusion to draw:

The referents that an anaphor refers back to are not (merely) part of what is true, but instead they are tied to particular linguistic expressions.

– Anaphora is an integral part of human language use.

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- A little joke I found on the internet:

(21) a. Human: What do you want?
b. Computer: To understand anaphora!
c. Human: When do you want it?
d. Computer: When do I want what?

Some terminology

- Let's say that an anaphor binds to a previous expression.

(22) 
A woman is in the park. She walks.

- Let's say that such expressions that anaphora can bind to have binding potential.

Blocked potential

- “someone” has binding potential for pronominal anaphora.

(23) Someone walks. She looks happy.

- But not in all sentences:

(24) It is not the case that someone walks. ✗She looks happy.

(25) Either someone walks or it rains. ✗She looks happy.

(26) If someone walks, it is sunny. ✗She looks happy.

We want a systematic theory

of what binding potential is

and of when we can access this potential.

Anaphora

Binding

Binding

Sentential Connectives

- We already know some expressions that compose sentences.
- *and* $\wedge$
- *or* $\vee$
- *if ... then* $\rightarrow$
- And some expressions that modify sentences.
- *not* $\neg$
- *maybe*

Sentential Connectives (contd.)

- If you have two sentences *A* and *B* which you understand, then you also understand:
- *A and B* is true if *A* is true and *B* is true.
- *A or B* is true if *A* is true or *B* is true.
- *if A then B* is true if *A* is false or *B* is true.
- *not A* is true if *A* is false.
- (let's not worry about *maybe* right now)

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(Jane Austen, Sense and Sensibility)

A first attempt

– A logician would say that expressions with binding potential are like existential quantifiers.

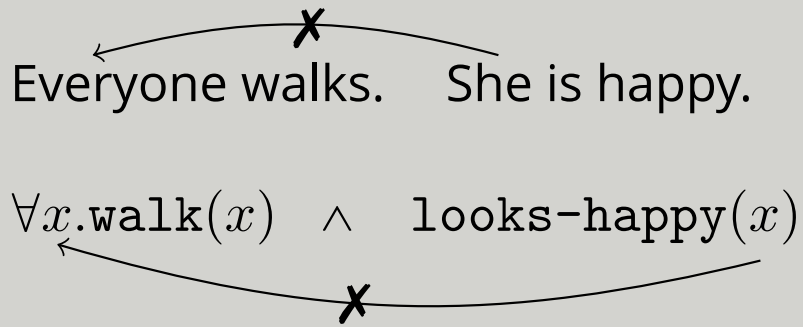
$$\textit{someone} \approx \exists x$$

(27) Someone walks. She looks happy.

$\exists x.\texttt{walk}(x) \quad \wedge \quad \texttt{looks-happy}(x)$

– Universal quantification does not have binding potential for singular pronominal anaphora.

(28)



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It really is the anaphor's fault

- It's not because there are two anaphora:

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- It's not because of the "if... then":

(32) Every farmer who owns a donkey beats it.

– Again, this is a *general* property of anaphora.

Adjectival:

(33) If Hoa is away, then so is Damaya. (They always travel together)

Temporal:

(34) If I drink, then I'm hungover the next morning.

Propositional:

(35) If Damaya , Essun doubts it.

Binding

Discourse Representation Theory

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Discourse and Story

- In literary criticism, one separates a narrative into story and discourse.
- A discourse is a text. What happens might be reported out of order.
- A story is the sequence of happenings that is described in the text.
- If we are reading a discourse and we cannot determine the story, we find the discourse incoherent.

What is a story?

- What's in a story? Think of it like a theatre play.

1. The referents. (or *dramatis personae*).
2. The conditions: what the referents do / what happens to the referents.

- The sentence "He beats it" does not have truth-conditions.

- It only has meaning if we know which actor "he" is.

Discourse is HOW a narrative is told.

Story is WHAT happens in the narrative.

A story contains things we talk about and what happens to these things.

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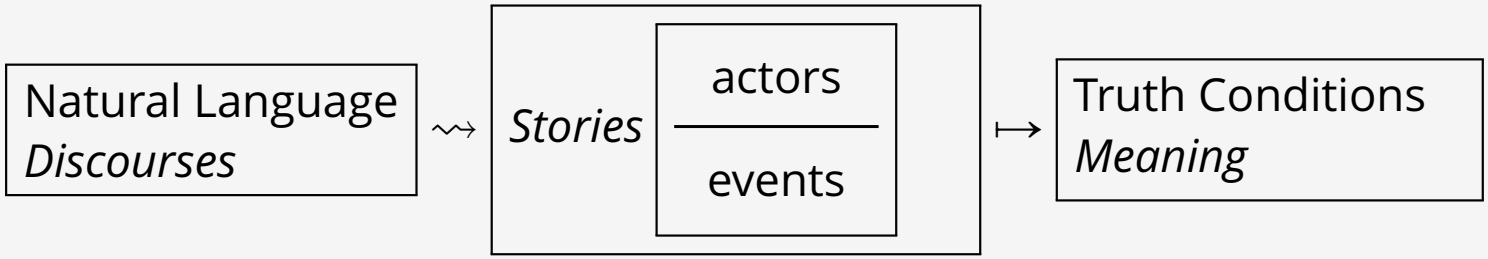
- Stories contain actors, and say something about these actors.
- 

Discourse Representation Structures

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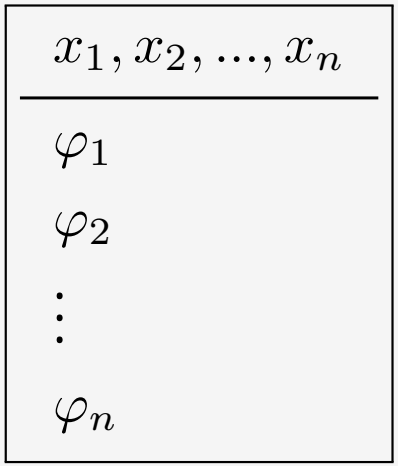
- Previously, we tried to assign truth conditions to discourses directly, but we didn't get far.
- So we construct an intermediate representation for stories.
- A "box" that keeps track of *what there is* separately of *what these things do* is called a Discourse Representation Structure.



$\leftarrow$ the things we talk about

$\leftarrow$ what we say about these things

Separation of Reference and Predication

- I think it is an extremely good idea to do it like this.
- We won't do dialogues here, but consider this:

(36) a. Hoa: There is a cat outside.
b. Jija: No, it's a dog.

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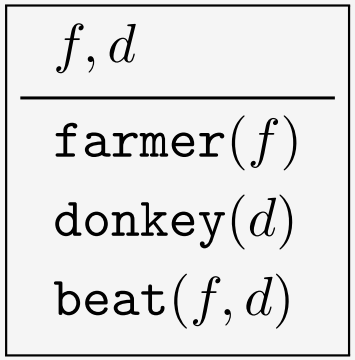
(36) a. Hoa: There is a cat outside.
b. Jija: No, it's a dog.

(37) a. Hoa: There is a cat outside.
b. Jija: It is not the case that there is a cat outside. It's a dog.

(38) a. Hoa: There is a cat outside.
b. Jija: There is no cat outside. It's a dog.

A Simple DRS

- "A farmer beats a donkey."
- 

- $\langle \{f, d\}, \{\texttt{farmer}(f), \texttt{donkey}(d), \texttt{beat}(f, d)\} \rangle$.

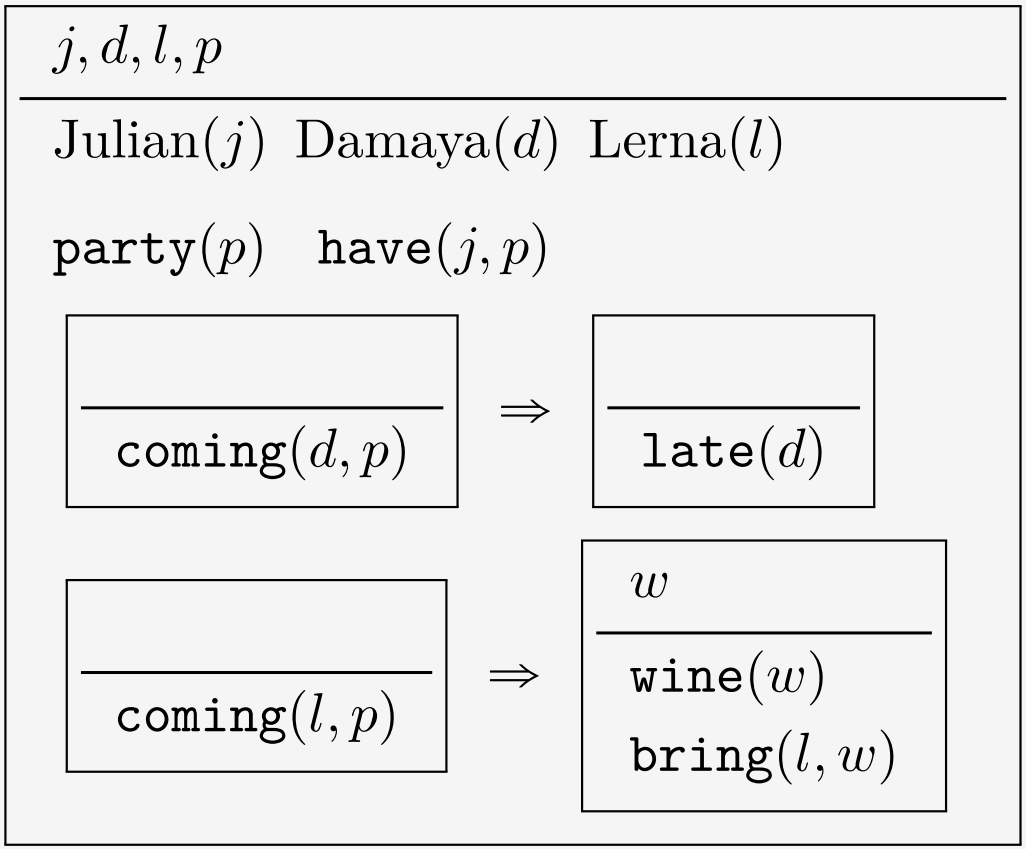
Now, the stroke of genius (Hans Kamp):

Stories have Sub-stories.

Boxes can appear in boxes.

A Less Simple DRS

(39) I'm having a party.
If Damaya is coming to it, she is late.
If Lerna is coming to it, he will bring wine.



The Language of DRSs

- Take VAR a set of variables.
- Take NAME a set of designators ("names").
- Take PRED a set of predicates / properties.
- A Discourse Representation Structure is a box $K = \boxed{\begin{array}{c}\mathrm{VARs} \\ \hline \mathrm{CONs}\end{array}}$

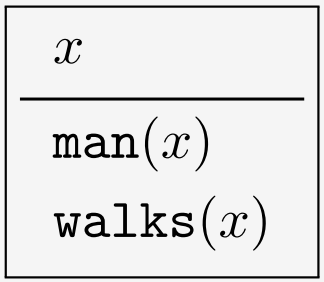
- CONs are constructed as follows:
- if N is a NAME and x is a VAR, $N(x)$ is a CON;
- if P is a PRED and $x_1, ..., x_n$ are VARs, $P(x_1, ..., x_n)$ is a CON;
- if x and y are VARs, $x = y$ is a CON;
- if K is a DRS, then $\neg K$ is a CON;
- if K and K' are DRSs, then $K \bigvee K'$ is a CON;
- if K and K' are DRSs, then $K \Rightarrow K'$ is a CON.

A New Way To Think About *if* and *every*

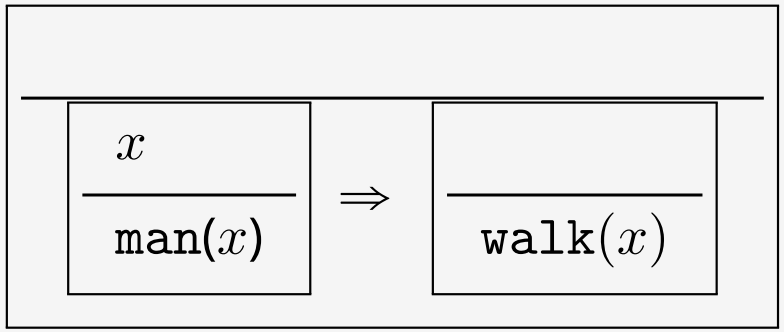
- The idea:
- "If a farmer owns a donkey, he beats it" is a bit like Whenever a farmer owns a donkey, he beats it.
- Better yet, write *Whenever the story is such that it contains a farmer, a donkey and the farmer owns the donkey, then the story is such that the farmer beats the donkey.*

Indefinites vs Quantifiers

"A man walks."



"Every man walks."



Binding Potential

- The conditions in a box can talk about the referents on the top of the same box.
- But sometimes, referents on top of one box are available to talk about in other boxes.
- Intuitively, in a sub-story you can talk about the actors of the bigger story.
- But in the bigger story you are not (always) allowed to speak about actors of a sub-story.

Binding: The Rules (informal)

- You can go left in conditionals.
- If a DRS K' is contained in a DRS K, then in K' you can talk about referents in K.

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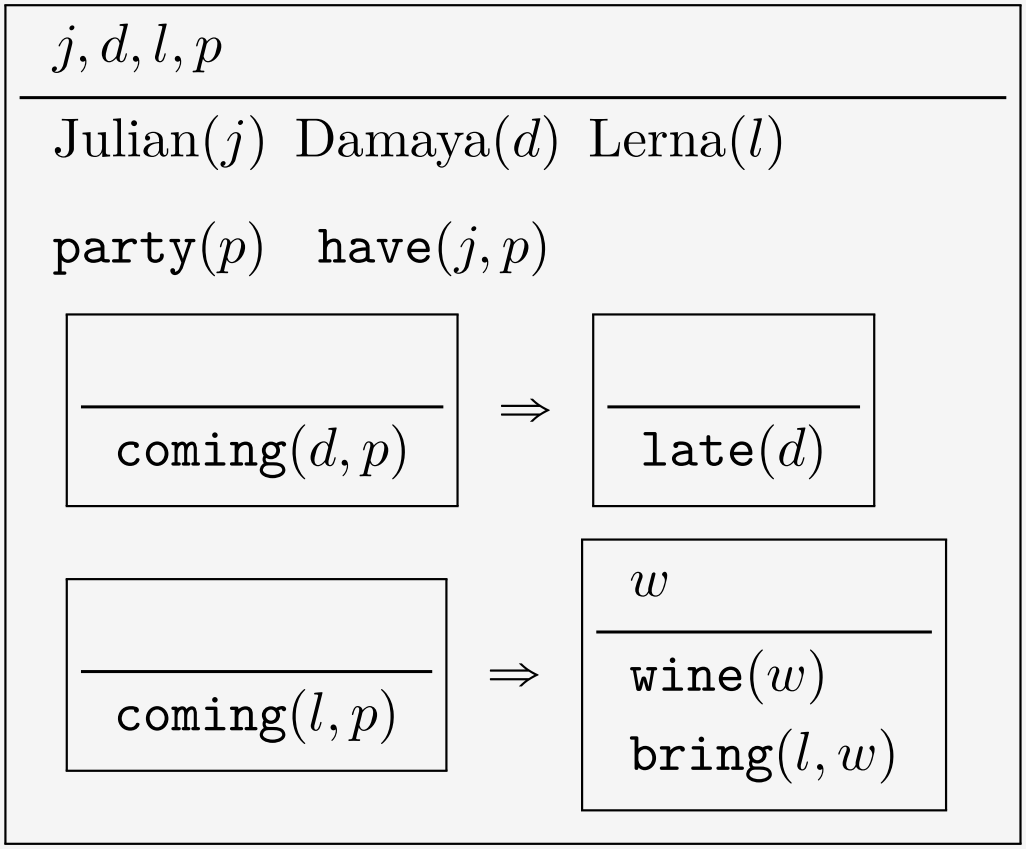

And Formally (not as bad as it looks)

Subordination

A DRS K' is **immediately subordinate** to a DRS K iff:

1. K contains the condition $\neg K'$; or
2. K contains a condition of the form $K' \vee K''$ or $K'' \vee K'$.
3. K contains a condition of the form $K' \Rightarrow K''$.
4. There a condition $K \Rightarrow K'$.

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K' is **subordinate** to K if K' is connected to K via immediate subordination ("up or left in conditionals").

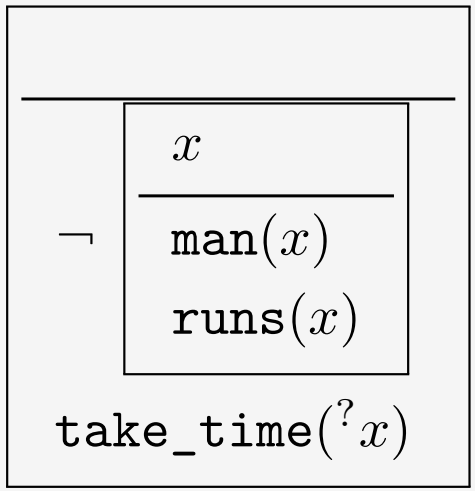
That is, if there is a chain $K' = K_1, K_2, ..., K_{n-1}, K_n = K$ where for all i, K_i is immediately subordinate to K_{i-1}.

– Now, a pronoun in K' can access referents in all DRSs K that K' is subordinate to.

Accessibility (Negation)

- Negation blocks binding.

(40) It is not the case that a man is running. #He takes his time.



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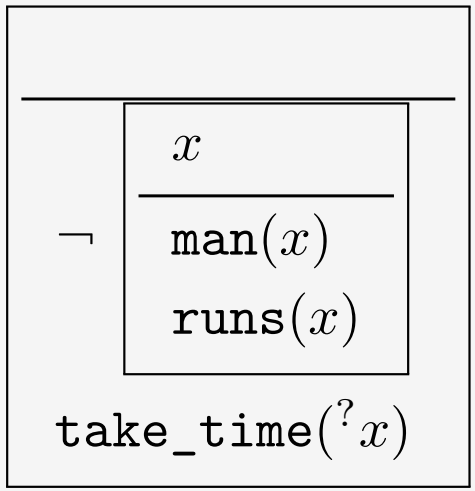


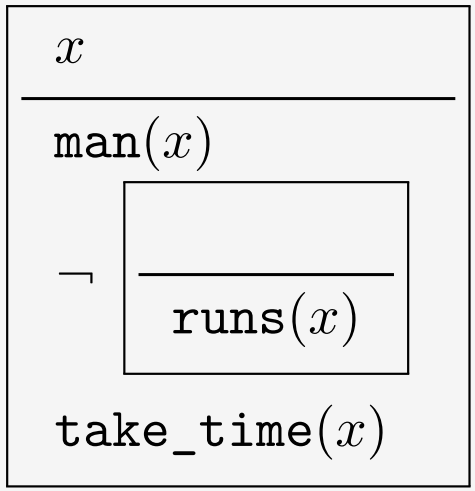
- This is actually fine, but for different reasons (later!):

(41) It is not the case that Jija is running. He takes his time.

Accessibility (Negation)

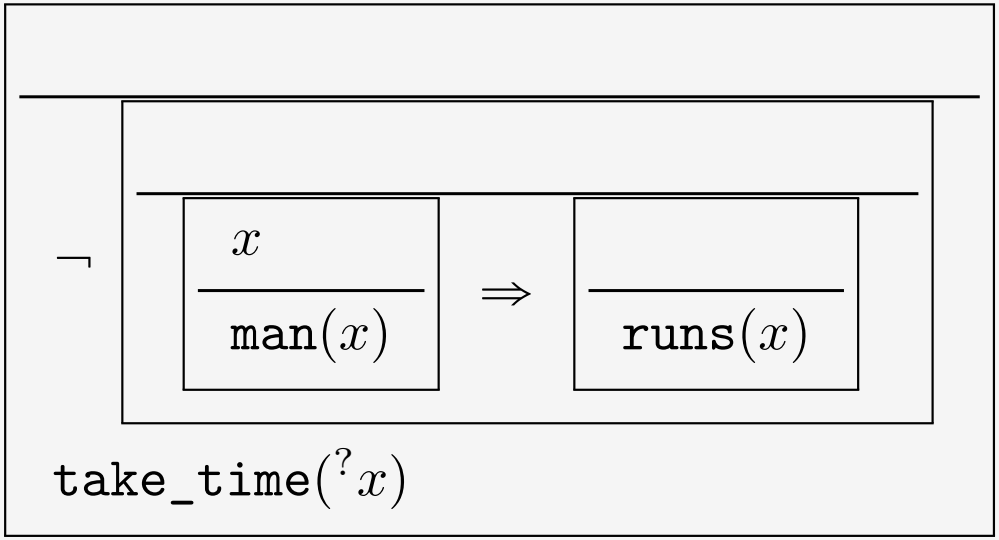
- Negation blocks binding—but only if the referent is below the negation.

(42) A man is not running. He takes his time.



Accessibility (Negation)

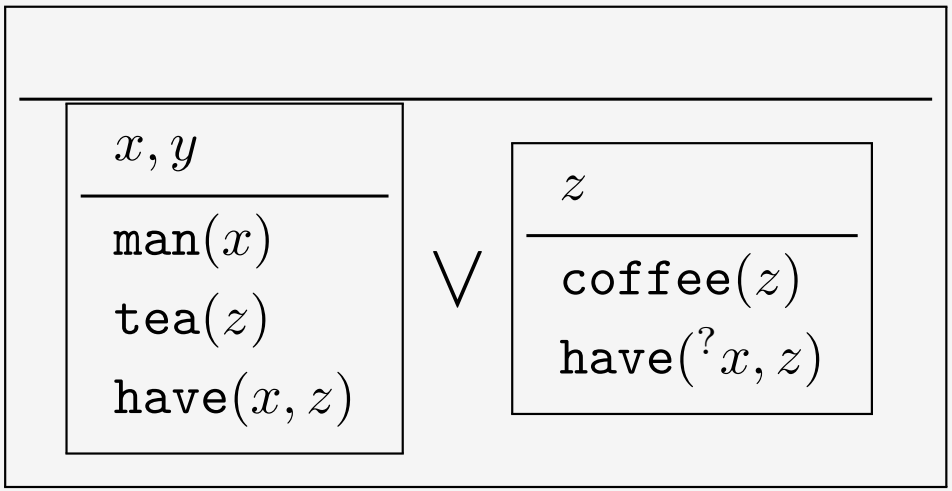
(43) Not every man is running. #He takes his time.



Accessibility (Disjunction)

– Can't go left or right in disjunction (this is actually controversial).

(44) Either a man is having tea or $^{?}$he is having coffee.



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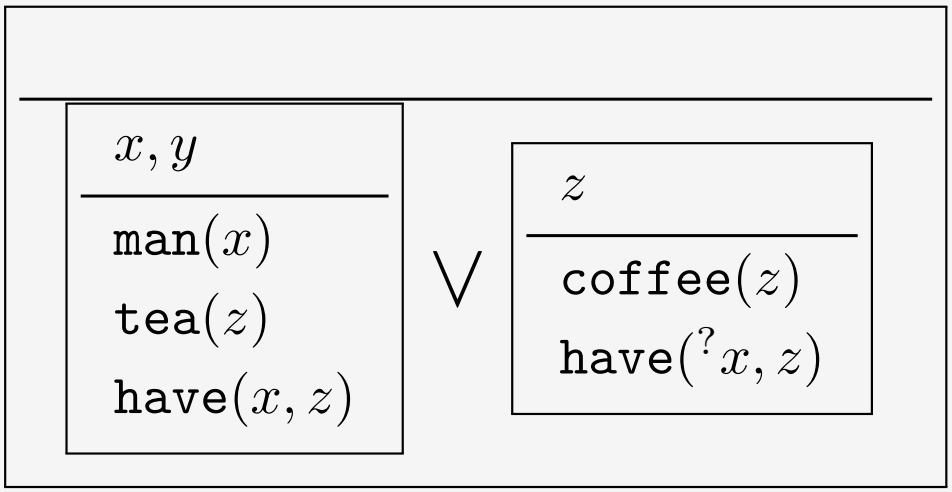

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Discourse Representation Theory

Truth

Truth

Interpretation of DRSs: World Model

- We want to have a mathematical notion of truth conditions.
- A world model is a tuple $M = (D_M, N_M, P_M)$ where
- D_M is a set of things (the domain),
- N_M is an assignment of names to things ($N_M : \mathrm{NAME} \to D_M$),
- and P_M is an assignment of properties to the set of all things that have that property ($P_M : \mathrm{PROP} \to \mathcal{P}(D_M^{<\omega})$.

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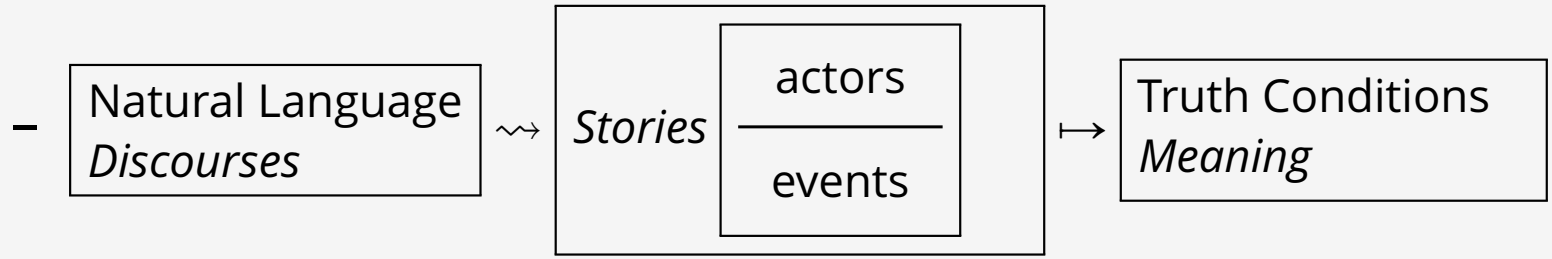
- A sentence like "Julian is happy" is true in M iff the set $P_M(\texttt{happy})$ contains the thing $N_M(\mathrm{Julian})$.
- We write $M \models \varphi$ for "φ is true according to M".


Natural Language
Discourses
⇝
Stories
actors
events
↦
Truth Conditions
Meaning

Interpretation of DRSs: Referent Extension

- The idea is this: a DRSs tells us a story about how some things have some properties.
- To evaluate whether it is true, we need to find people in a world model that have these properties.

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- To evaluate whether it is true, we need to find people in a world model that have these properties.

Referent Assignments

Let $M = (D_M, N_M, P_M)$ be a model. Let $a, b : \mathrm{VAR} \to D_M$ be partial functions from variables to objects in the model.
Write $b > a$ ("b extends a") if for all x that a assigns something to, $a(x) = b(x)$.

Interpretation of DRSs: Truth

- The conditions on the context referents impose tests.
- We define truth in a model relative to a variable assignment.

DRT Semantics

1. $M, a \models \langle \mathrm{REFs}, \mathrm{CONs} \rangle$ iff a assigns something to all REFs and $M, a \models C$ for all CONs.

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   b. $M, a \models \mathrm{n}(x)$ iff $a(x)$ is in $N_M(\mathrm{n})$.
   c. $M, a \models \mathtt{p}(x_1, \cdots, x_n)$ iff $(a(x_1), \cdots, a(x_n))$ is in $P_M(\mathtt{p})$.

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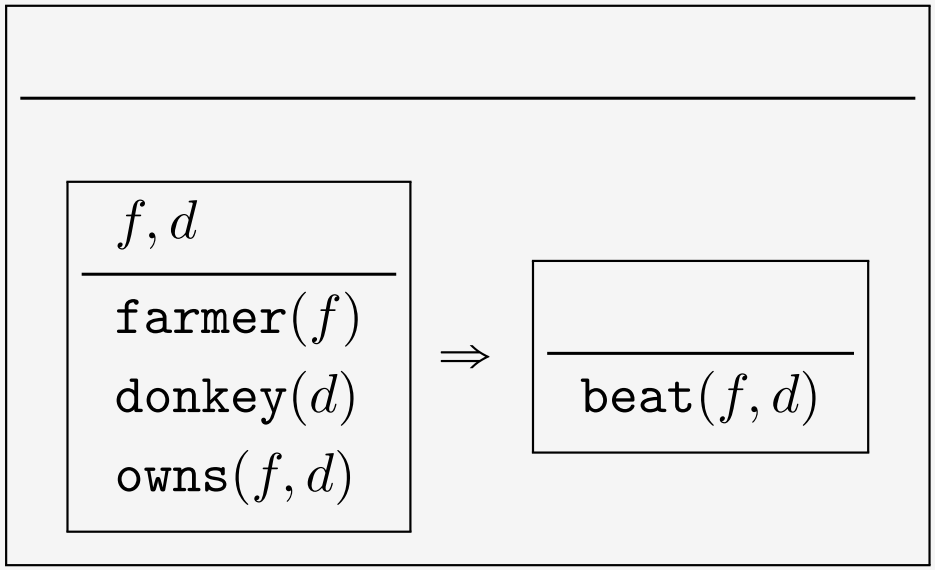
4. $M, a \models K_1 \Rightarrow K_2$ iff for every $b > a$ with $M, b \models K_1$ there is a $c > b$ with $M, c \models K_2$.

Donkey Sentences, Informally

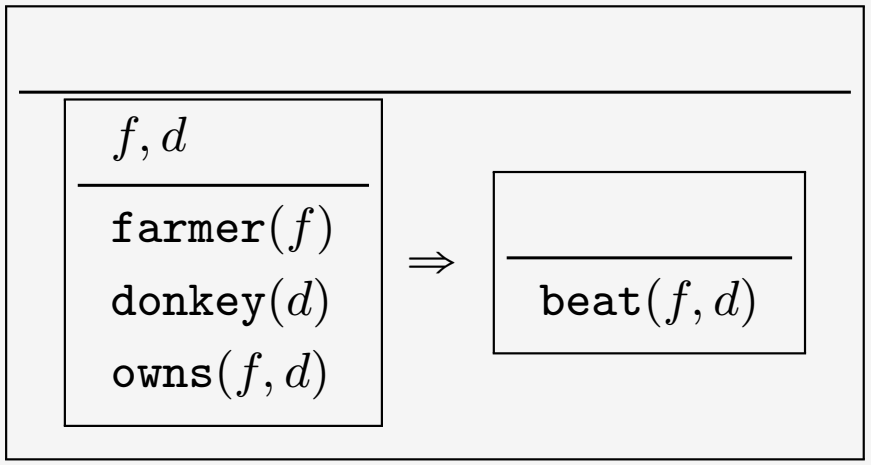
– “If a farmer owns a donkey, he beats it.”

–

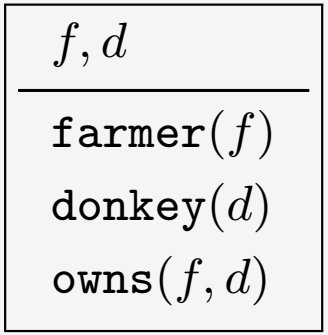


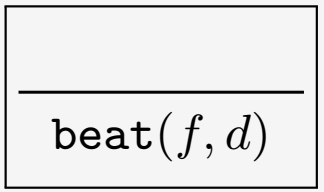
– $\approx$ Whenever we have a farmer and we have a donkey and the farmer owns the donkey, then the farmer beats the donkey.

Donkey Sentences, Formally

- 

is true for M, a iff

- For every $b > a$ with $M, b \models$ 

  There is a $c > b$ with $M, c \models$ 

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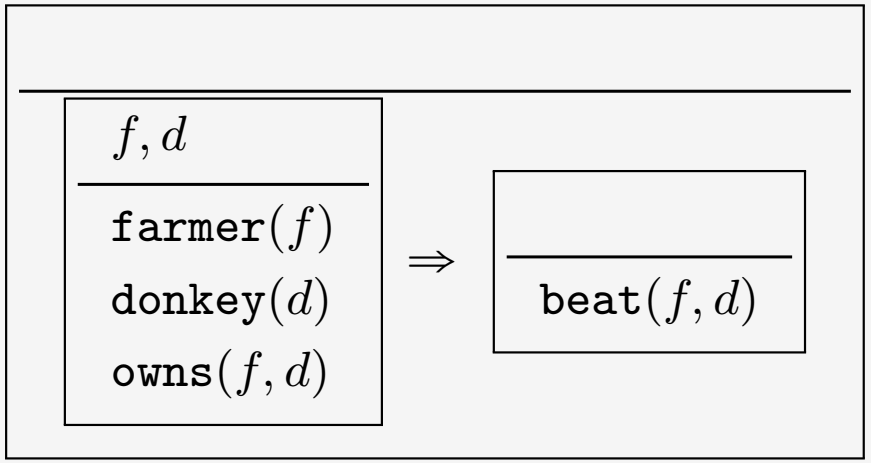
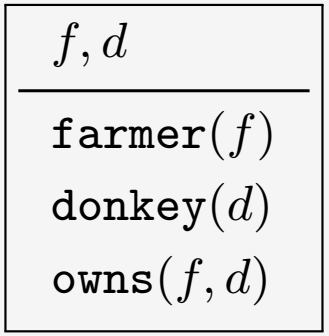
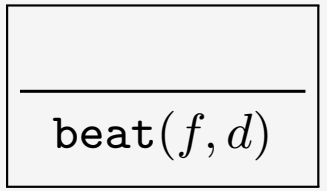
- 

is true in M iff
  - Because the top part of the right box is empty, $c = b$.

For every $b > a$ with $M, b \models$ 

, $M, b \models$ 

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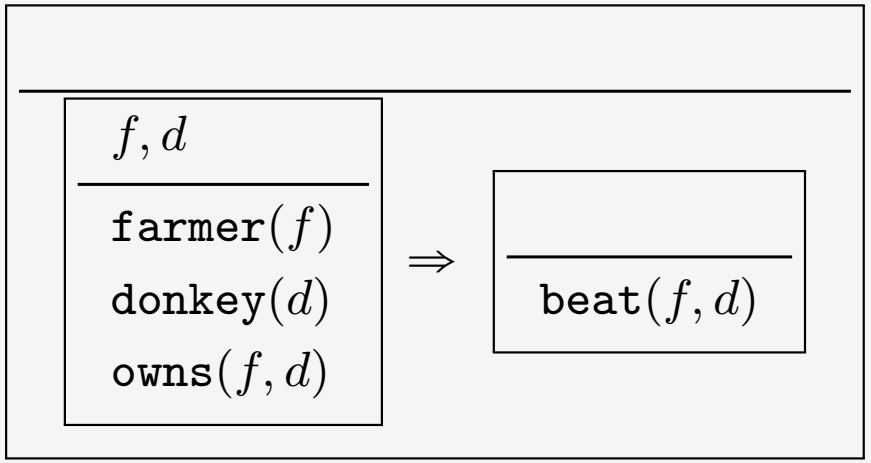
- 

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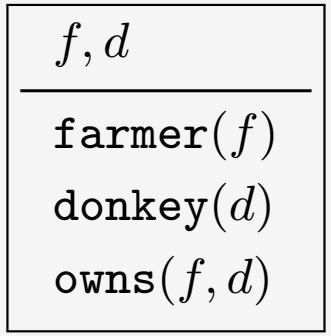
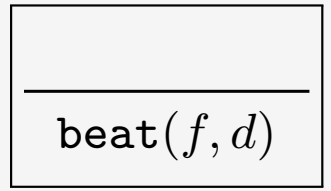
For every $b > a$ with $M, b \models$ 

, $M, b \models$ 

This is true exactly if (in M) all farmers beat all their donkeys!

This slide is only for people with a first course in logic.

- DRT embeds into classical (Tarskian) First Order Semantics.

DRT embeds into FOL

Define recursively:

- $(P^k(x_1, \ldots, x_k))^\heartsuit = P^k x_1, \ldots, x_k$;
  $(x_i = x_j)^\heartsuit = (x_i = x_j)$;
  $(\neg K)^\heartsuit = \neg K^\heartsuit$;
  $(K_1 \vee K_2)^\heartsuit = (K_1^\heartsuit \vee K_2^\heartsuit)$;

- If $K_1 = \langle \{x_1, \ldots, x_n\}, \{\mathrm{Con}_1, \ldots, \mathrm{Con}_m\} \rangle$, then

  $K_1^\heartsuit = \exists x_1 \ldots \exists x_n (\mathrm{Con}_1^\heartsuit \wedge \ \ldots \ \wedge \mathrm{Con}_m^\heartsuit)$;
  $(K_1 \Rightarrow K_2)^\heartsuit = \forall x_1 \ldots \forall x_n ((\mathrm{Con}_1^\heartsuit \wedge \ \ldots \ \wedge \mathrm{Con}_m^\heartsuit) \rightarrow K_2^\heartsuit)$.

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- For all f: $M, f \models_{DRT} K$ iff $M, f \models_{FOL} K^\heartsuit$.

Truth

Constructing DRSs

Constructing DRSs

Recap

- "To understand (the meaning of) a sentence is to know the circumstances in which it is true."
- We have seen some sentences that we cannot seem to understand.

  → incoherent sentences.

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  → incoherent sentences.
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- "To understand (the meaning of) a sentence is to know the circumstances in which its semantic representation is true."

Recap

- "To understand (the meaning of) a sentence is to know the circumstances in which it is true."
- We have seen some sentences that we cannot seem to understand.

  $\rightarrow$ incoherent sentences.
- So now we speak not of the truth of sentences (should not do that anyway!) but of the truth of semantic representations.
- "To understand (the meaning of) a sentence is to know the circumstances in which its semantic representation is true."
- $\boxed{\text{Natural Language Sentences}} \rightsquigarrow \boxed{\text{DR Structures}} \mapsto \boxed{\text{First Order Models}}$,

  where:

  $\rightsquigarrow :=$ the discourse representation *construction algorithm*,

  $\mapsto :=$ a truth-conditional model-theoretic *embedding*.

DRS Construction Algorithm (Kamp and Reyle 1993)

DRS-Construction Algorithm

Input: a discourse $D = S_1, ..., S_i, S_{i+1}, ..., S_n$
the empty DRS K_0

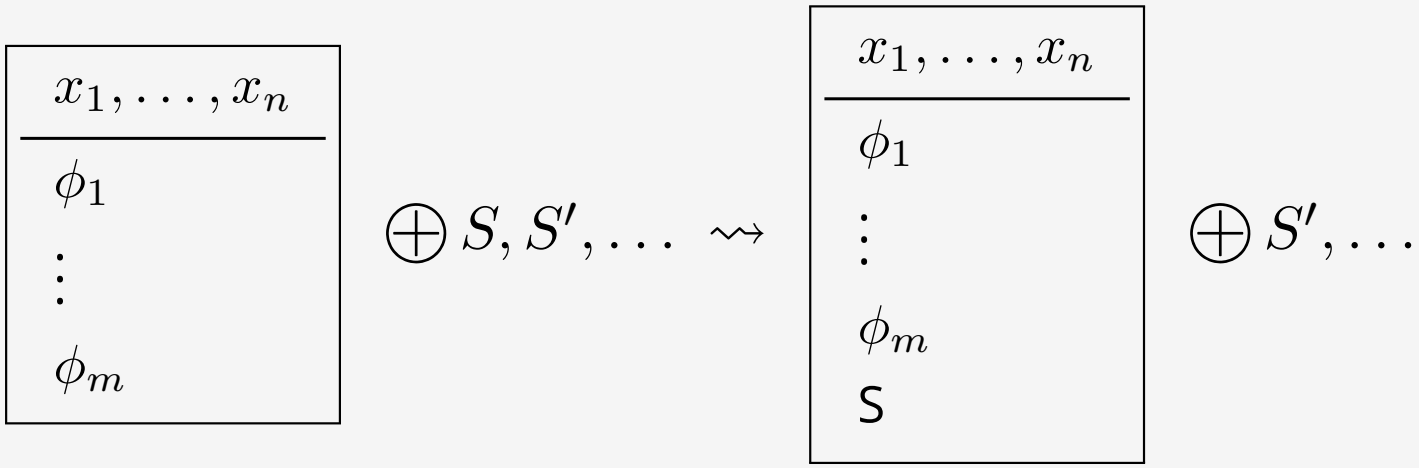
Keep repeating for $i = 1, ..., n$**:**

(i) add the syntactic analysis $[S_i]$ of (the next) sentence S_i to the conditions of K_{i-1}; call this DRS K_i*. Go to (ii).

(ii) Input: a set of reducible conditions of K_i*
Keep on applying construction principles to each reducible condition of K_i* until a DRS K_i is obtained that only contains irreducible conditions. Go to (i).

– (It's a *shift-reduce* algorithm, in case that means something to someone.)

Segmentation

– 

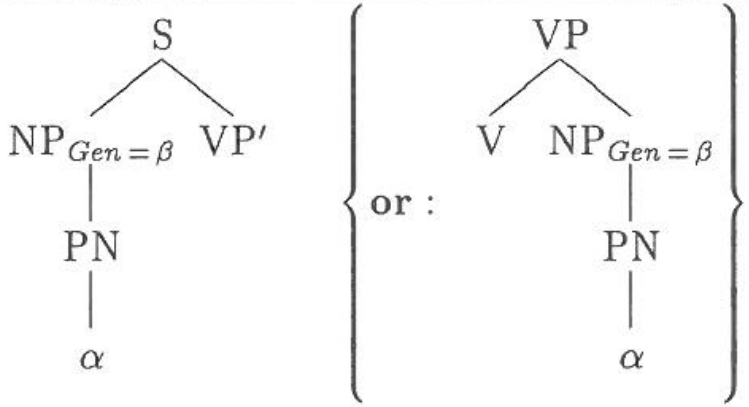
– If this stops before all S have been dealt with, the discourse is incoherent.

DRS Construction Algorithm: Names

– A first attempt:

CR.PN

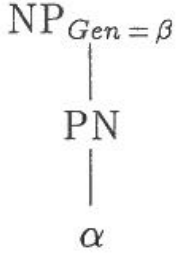
Triggering configuration $\gamma \subseteq \overline{\gamma} \in \mathbf{Con_K}$:



Introduce into the universe of the main DRS: new discourse referent **u**

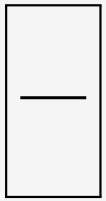
Introduce into the condition set of the main DRS: new conditions $\alpha(\mathbf{u})$, $Gen(\mathbf{u}) = \beta$

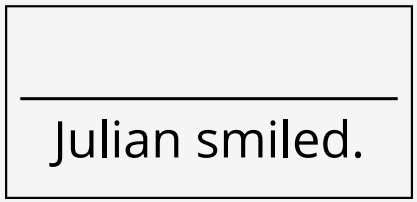
Substitute in $\overline{\gamma}$: **u** for



Example: Names

Julian smiled. He saw a cat.

$\rightsquigarrow$  $\oplus$ Julian smiled $\oplus$ He saw a cat.

$\rightsquigarrow$ 

$\oplus$ He saw a cat.

Example: Names

Julian smiled. He saw a cat.

$\rightsquigarrow$ $\boxed{\quad}$ $\oplus$ Julian smiled $\oplus$ He saw a cat.

$\rightsquigarrow$ $\boxed{\dfrac{\quad}{\text{Julian smiled.}}}$ $\oplus$ He saw a cat.

$\rightsquigarrow$ $\boxed{\begin{array}{l} j \\ \hline \text{Julian}(j) \\ \text{Gen}(j) = \text{m} \\ j \text{ smiled.} \end{array}}$ $\oplus$ He saw a cat

Example: Names

Julian smiled. He saw a cat.

$\rightsquigarrow$ $\boxed{}$ $\oplus$ Julian smiled $\oplus$ He saw a cat.

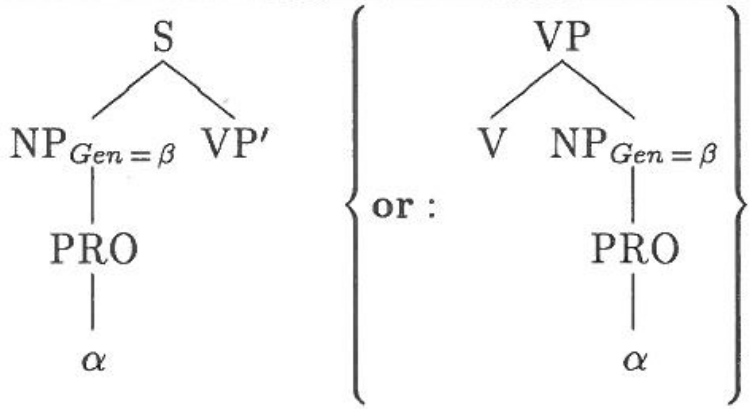
$\rightsquigarrow$ $\boxed{\begin{array}{c}\\ \hline \text{Julian smiled.}\end{array}}$ $\oplus$ He saw a cat.

$\rightsquigarrow$ $\boxed{\begin{array}{l} j \\ \hline \text{Julian}(j) \\ \text{Gen}(j) = \text{m} \\ j \text{ smiled.}\end{array}}$ $\oplus$ He saw a cat $\rightsquigarrow$ $\boxed{\begin{array}{l} j \\ \hline \text{Julian}(j) \\ \text{Gen}(j) = \text{m} \\ \texttt{smile}(j)\end{array}}$ $\oplus$ He saw a cat

DRS Construction Algorithm: Pronouns

CR.PRO

Triggering configuration $\gamma \subseteq \overline{\gamma} \in \mathbf{Con_K}$:

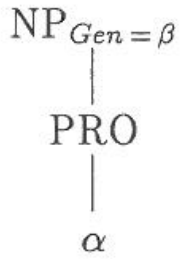


Choose suitable antecedent v, such that v is accessible and $Gen(\mathrm{v}) = \beta$

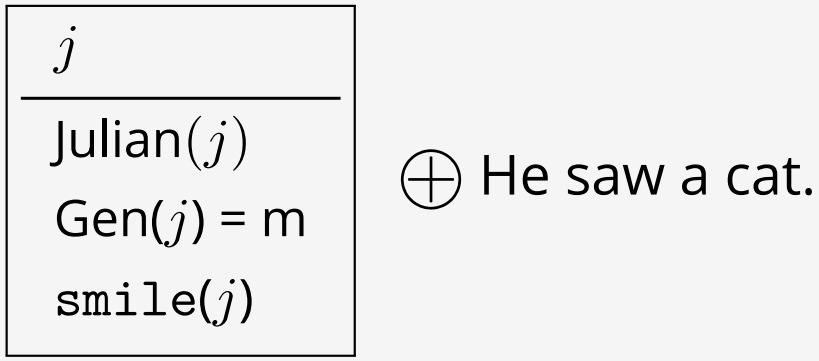
Introduce in $\mathbf{U_K}$: new discourse referent **u**

Introduce in $\mathbf{Con_K}$: new conditions $\mathbf{u} = \mathbf{v}$, $Gen(\mathbf{u}) = \beta$

Substitute in $\overline{\gamma}$: **u** for



Example: Pronouns



Example: Pronouns

j
Julian(j)
Gen(j) = m
`smile`(j)

$\bigoplus$ He saw a cat.

$\rightsquigarrow$

j
Julian(j)
Gen(j) = m
`smile`(j)
He saw a cat.

Example: Pronouns

j
Julian(j)
Gen(j) = m
`smile`(j)

$\oplus$ He saw a cat.

$\rightsquigarrow$

j
Julian(j)
Gen(j) = m
`smile`(j)
He saw a cat.

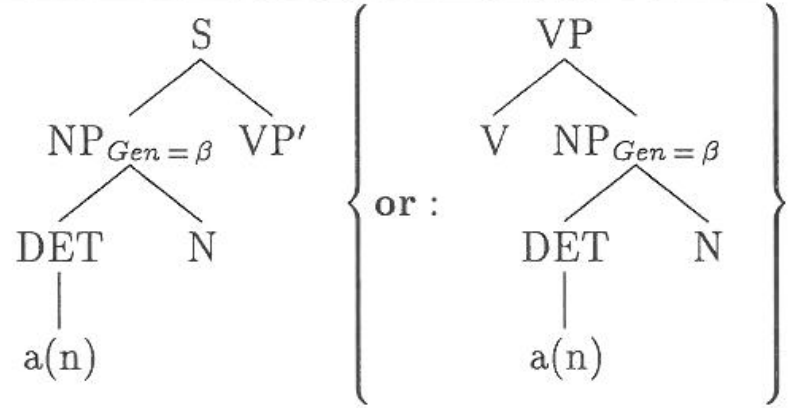
$\rightsquigarrow$

j, u
Julian(j)
Gen(j) = m
`smile`(j)
u = j
Gen(u) = m
u saw a cat.

DRS Construction Algorithm: Indefinites

CR.ID

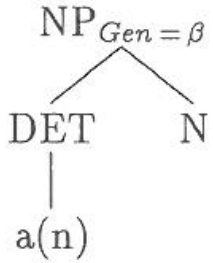
Triggering configuration $\gamma \subseteq \overline{\gamma} \in \mathbf{Con_K}$:



Introduce in $\mathbf{U_K}$: new discourse referent **u**

Introduce in $\mathbf{Con_K}$: new condition **[N](u)**, **Gen(u)=β**

Substitute in $\overline{\gamma}$: **u** for



Example: Indefinites

j,u
Julian(j)
Gen(j) = m
`smile`(j)
u = j
Gen(u) = m
u saw a cat.

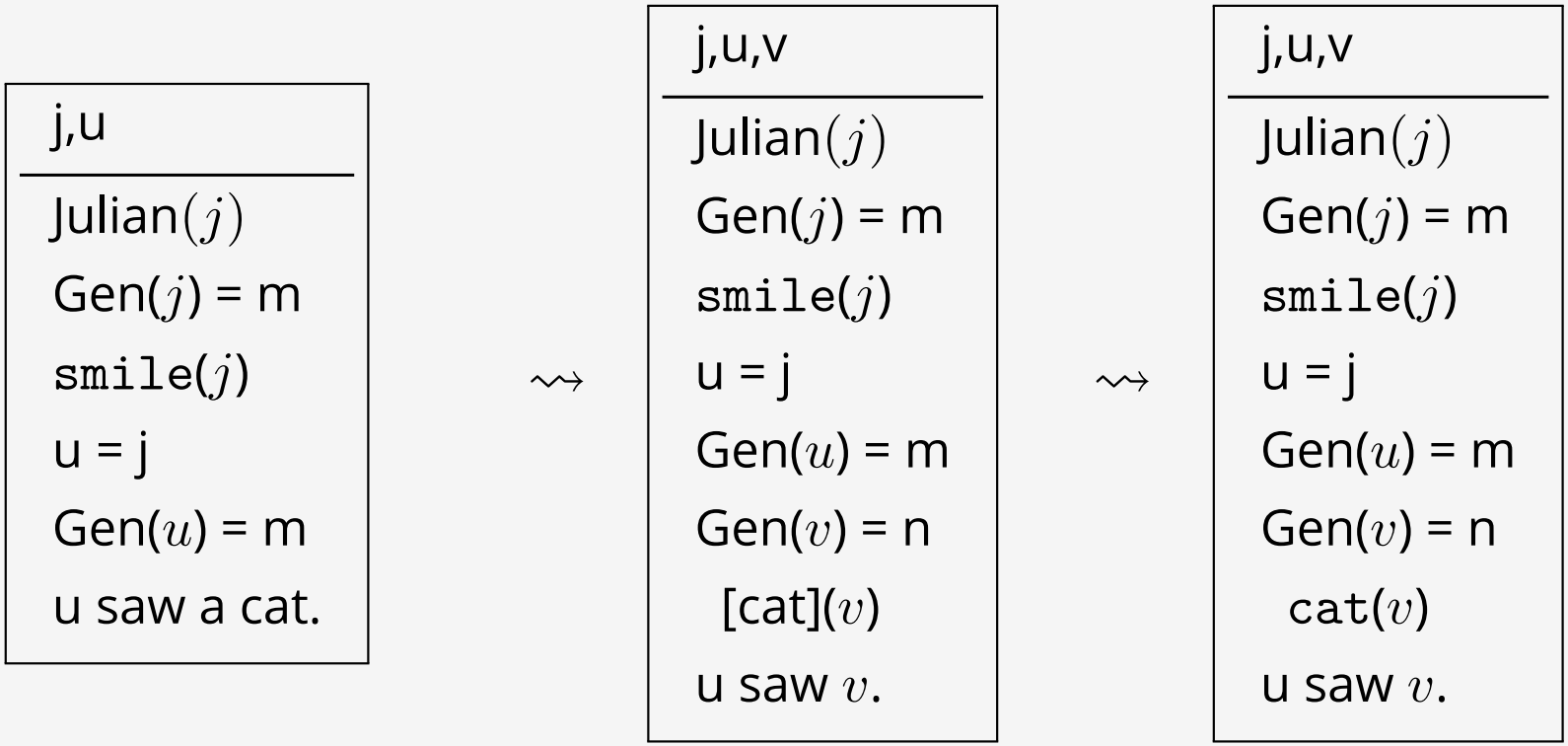
Example: Indefinites

j,u
Julian(j)
Gen(j) = m
`smile`(j)
u = j
Gen(u) = m
u saw a cat.

$\rightsquigarrow$

j,u,v
Julian(j)
Gen(j) = m
`smile`(j)
u = j
Gen(u) = m
Gen(v) = n
[cat](v)
u saw v.

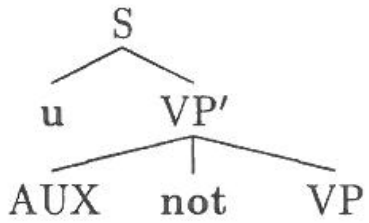
Example: Indefinites



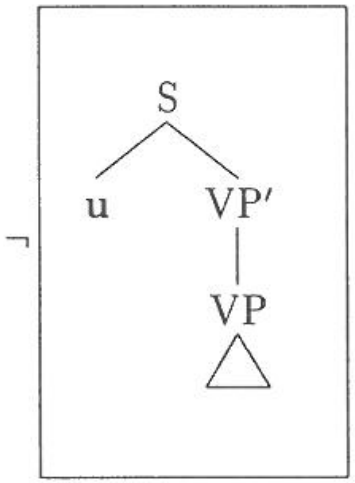
DRS Construction Algorithm: Negation

CR.NEG

Triggering configuration $\gamma \subseteq \overline{\gamma} \in \mathbf{Con_K}$:

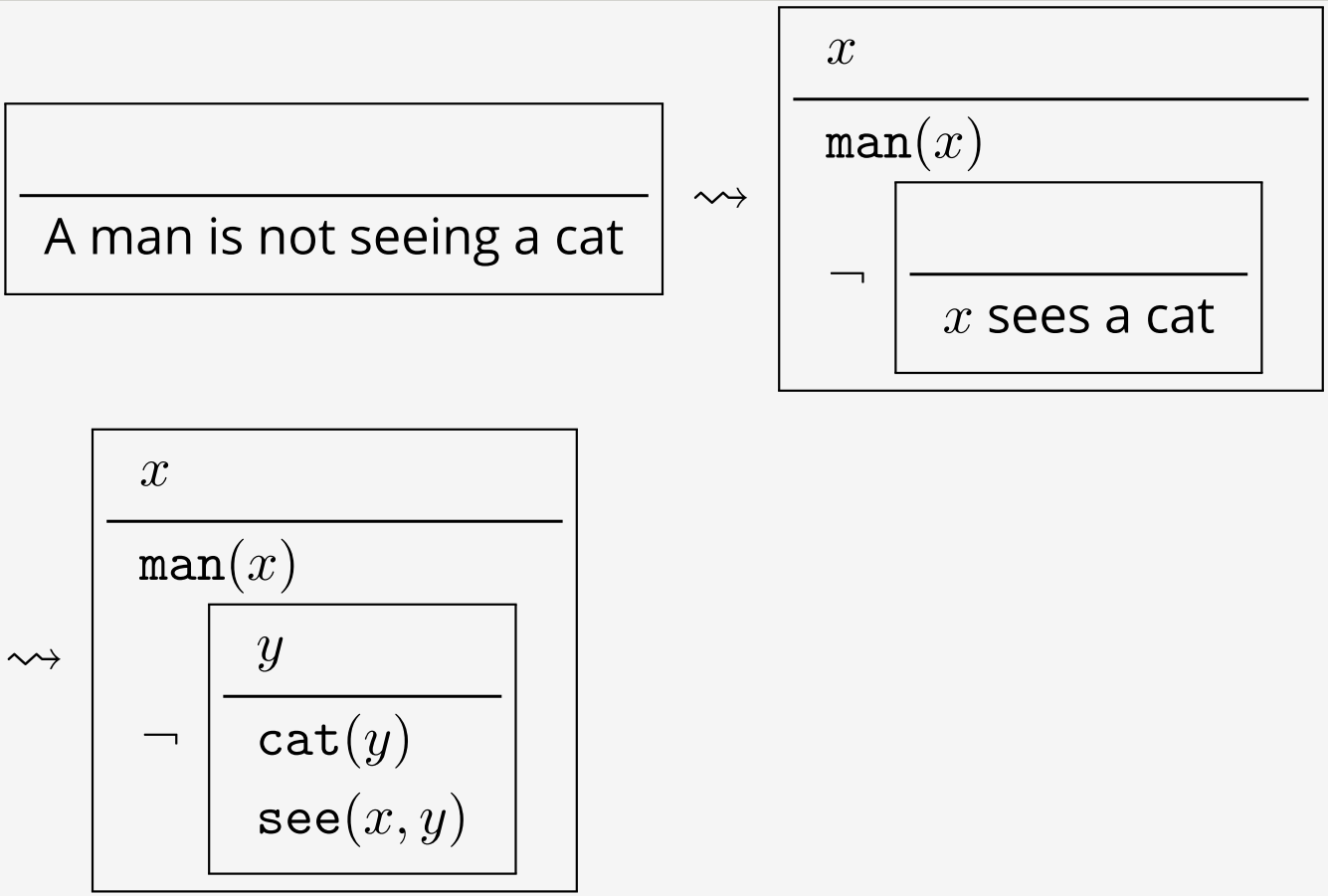


Replace $\overline{\gamma}$ **by:**

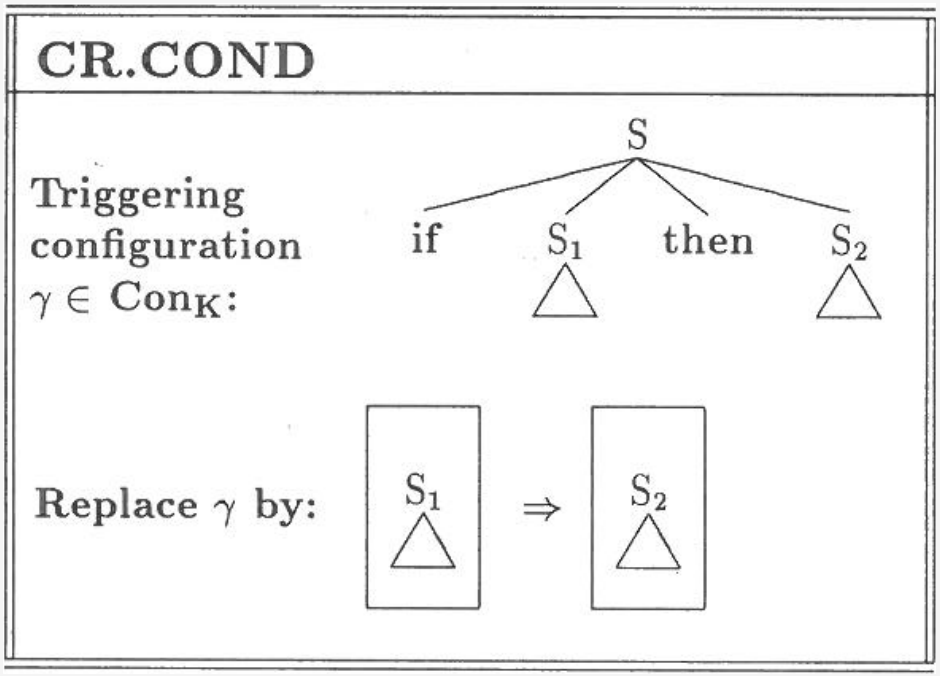


Example: Negation

(46) A man is not seeing a cat. He smiles, #it does not.

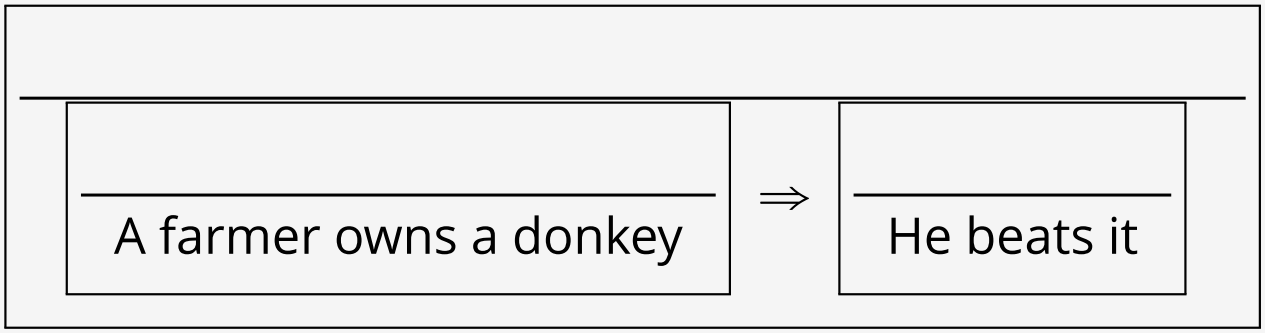


DRS Construction Algorithm: Conditionals

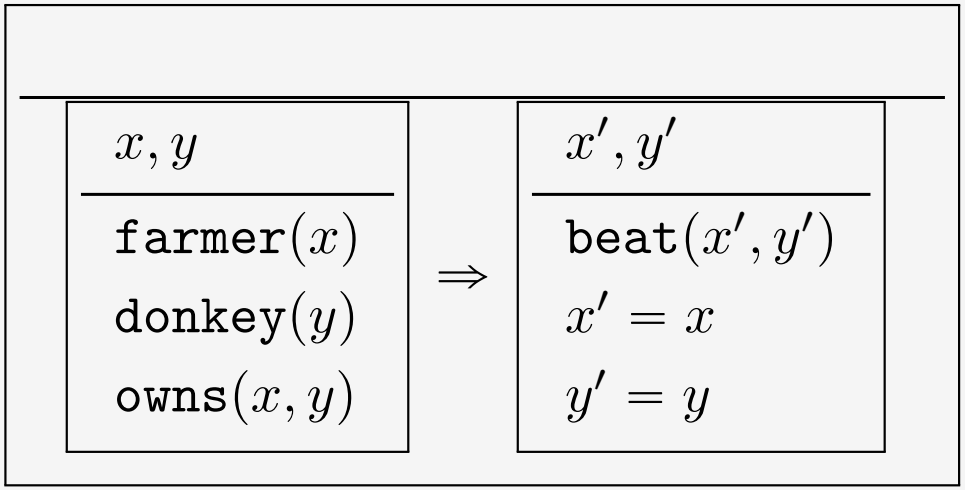


Example: Conditionals

(47) If a farmer owns a donkey, he beats it.



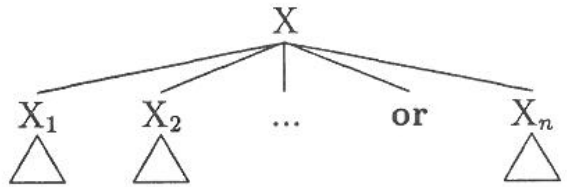
⇝



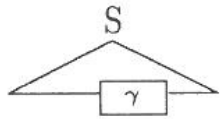
DRS Construction Algorithm: Sentential Disjunction

CR.OR(≠NP)

Triggering configuration $\gamma \subseteq \overline{\gamma} \in \mathbf{Con_K}$:



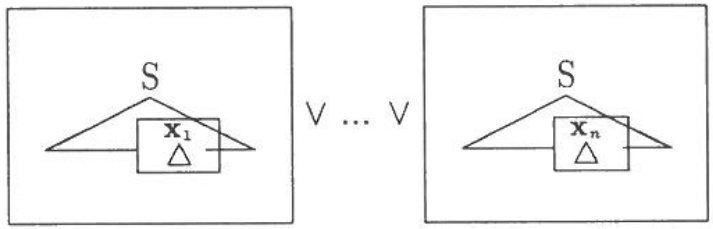
where $\overline{\gamma} =$



and $X \neq NP$

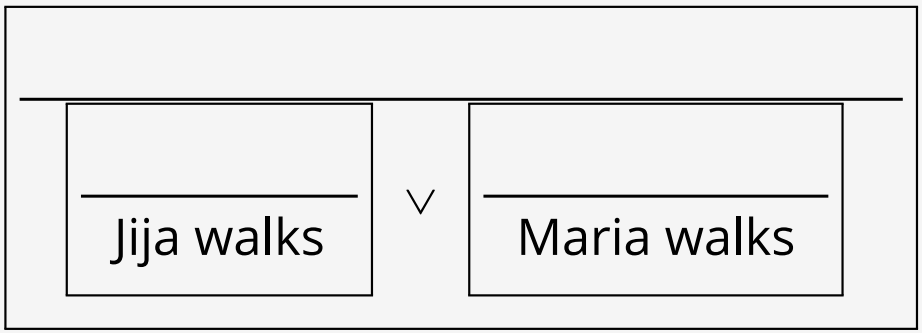
Operation:

Replace $\overline{\gamma}$ by:



Example: Sentential Disjunction

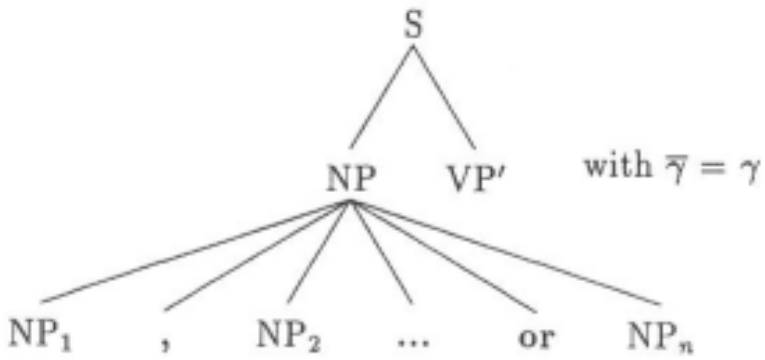
(48) Jija walks or Maria walks.



DRS Construction Algorithm: NP-Disjunction

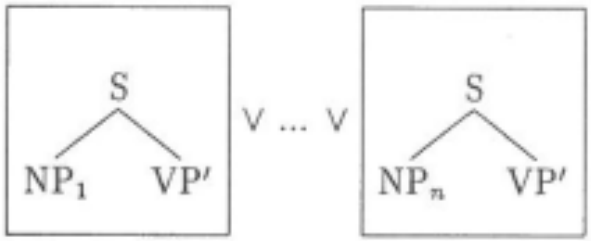
CR.OR(NP)

Triggering configurations $\gamma \subseteq \overline{\gamma} \in \mathbf{Con_K}$:



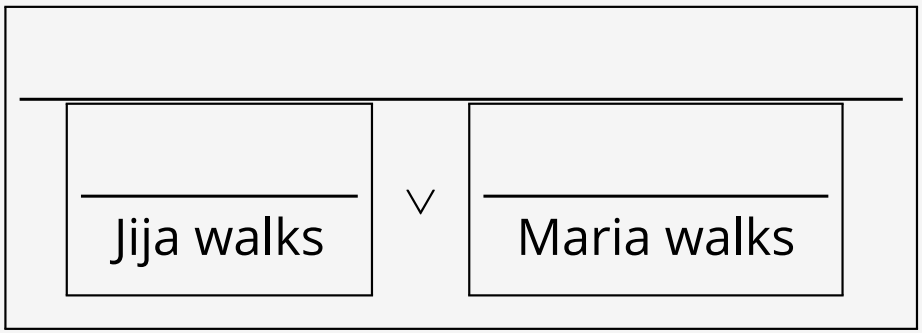
Operations:

Replace $\overline{\gamma}$ **by:**

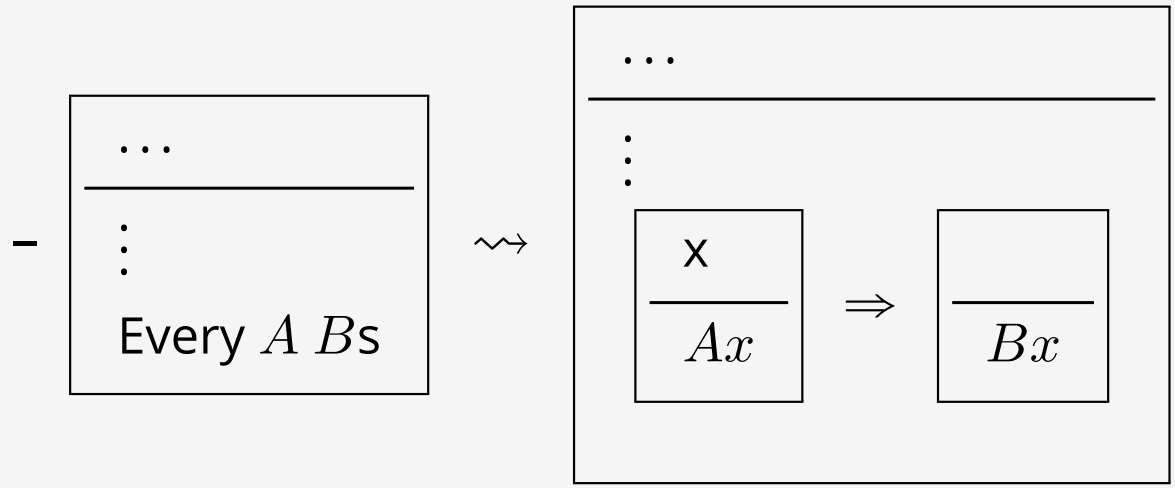


Example: NP Disjunction

(49) Jija or Maria walks.



Quantifier Constructions (Schematic)



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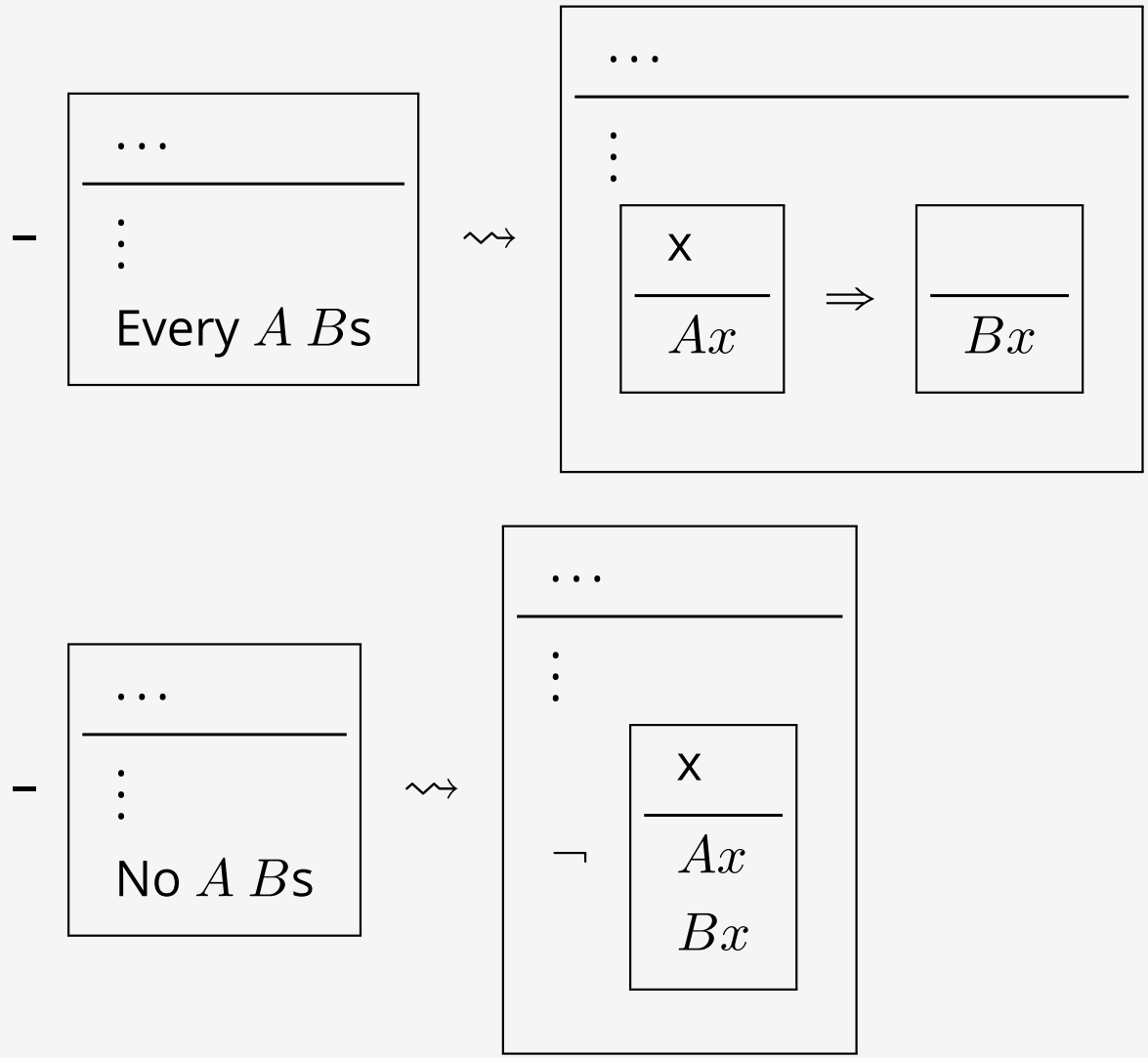
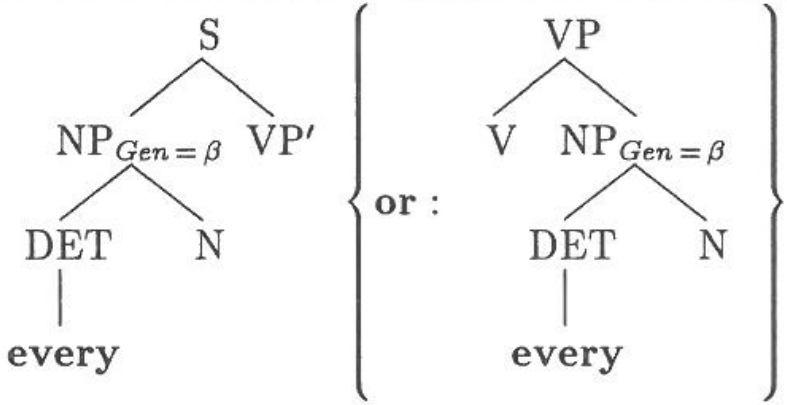


DRS Construction Algorithm: 'Every'

CR.EVERY

Triggering configuration $\gamma \subseteq \overline{\gamma} \in \mathbf{Con_K}$:



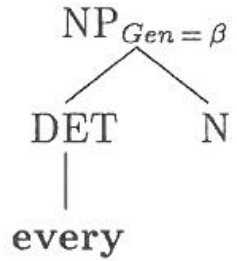
Introduce in $\mathbf{Con_K}$: new condition $K_1 \Rightarrow K_2$ with $K_1 = K_2 = \langle\{\}, \{\}\rangle$

Introduce in $\mathbf{U_{K_1}}$: new discourse referent **u**

Introduce in $\mathbf{Con_{K_1}}$: new condition **N(u)**

Introduce in $\mathbf{Con_{K_2}}$: new condition γ', where

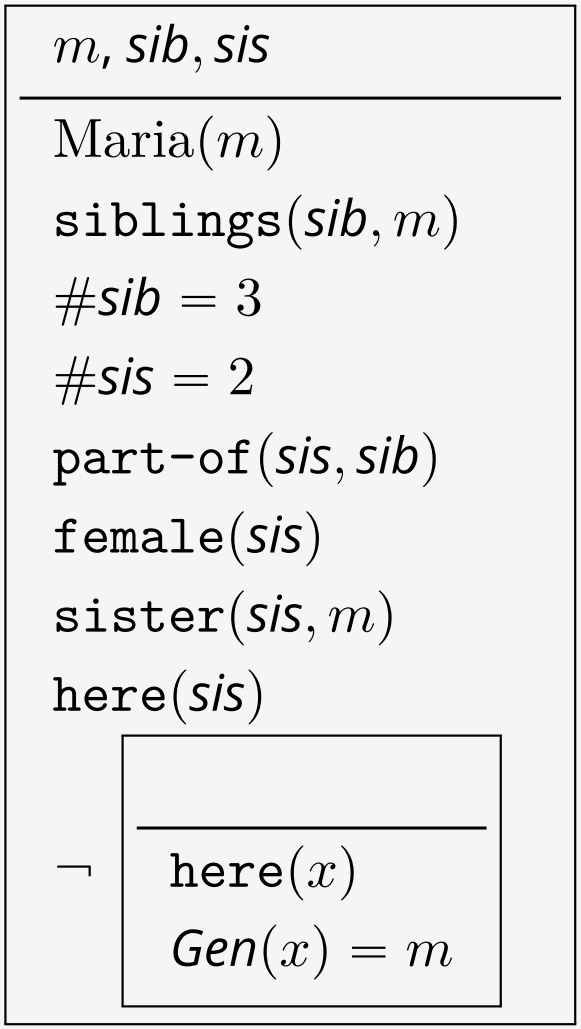
γ' results from $\overline{\gamma}$ by substituting: **u** for



Delete $\overline{\gamma}$ from $\mathbf{Con_K}$

Partee Sentences

(50) Maria has three siblings, two of whom are female.
Her sisters are here. ✗He is somewhere else.



You can do basically the same for any other kind of anaphora.

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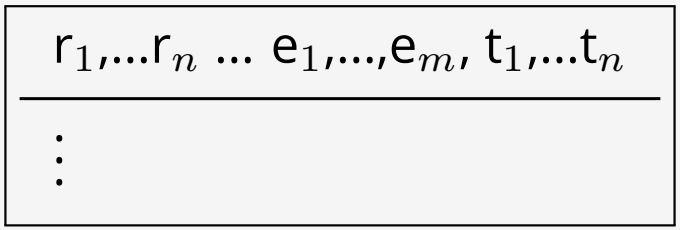

Constructing DRSs

Presupposition

Presupposition

The presuppositions of a sentence are the things that are required for the sentence to have a truth value at all.

Examples (1)

– I write ∂ for “it is presupposed that”.

(51) Jija *knows* that it is raining.
∂ It is raining.

(52) Jija *realised* that it is raining.
∂ It is raining.

(53) Jija *stopped* smoking.
∂ Jija smoked.

(54) Jija *started* smoking.
∂ Jija didn’t smoke.

Examples (2)

(55) Jija is smoking *again*.
∂ Jija smoked before.

(56) Jija *started* to smoke *again*.
∂ Jija smoked once, then didn't.

(57) *It was* Jija, *who* stole the cookies.
∂ Someone stole the cookies.

(58) Jija*'s* son is bald.
∂ Jija has a son.

Compared to Anaphora

- Presuppositions are different in Partee sentences.

(59) I have three siblings, two of whom are female.

a. My sisters are here. ✗He is somewhere else.

b. My sisters are here. ✓My brother is somewhere else.

- Presuppositions are similar in Donkey sentences.

(60) If a farmer owns a donkey, the farmer beats the donkey.

If a farmer owns a donkey, he beats it.

Frege–Strawson definition

A sentence s presupposes a sentence r iff whenever s is true or false, r is true. (Write $s \partial r$.)

- $\approx$ presuppositions are what is required for a sentence to have a truth value.
- *The king of France is bald.* ∂ *There is a king of France.*

Presupposition is not Entailment

- A proposition p entails a proposition q if whenever p is true, then q is true.
- A proposition p presupposes a proposition q if whenever p is true or false, then q is true.

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- Entailments go away under negation.

(61) Jija bought a green balloon. *entails* Jija bought a balloon.
Jija did not buy a green balloon. ~~*entails* Jija bought a balloon.~~

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(61) Jija bought a green balloon. *entails* Jija bought a balloon.
Jija did not buy a green balloon. ~~*entails* Jija bought a balloon.~~

- Presuppositions do not:

(62) Jija bought the green balloon. *psp* there is a green balloon.
Jija did not buy the green balloon. *psp* there is a green balloon.

Examples (3)

(63) Jija knows that it's raining.
Jija doesn't know that it's raining.

(64) The king of France is bald
The king of France isn't bald.

(65) Jija's son isn't bald.
∂ Jija has a son.

(66) It wasn't Jija, who stole the cookies.
∂ Someone stole the cookies.

Cancellation

- By common consent, presuppositions are not cancellable.

(67) # Jija knows that it is raining, but it is not raining.

(68) # The king of France is bald. France is a republic.

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- Less clear when embedded in negation:

(69) Jija doesn't knows that it is raining—it isn't raining!

(70) The king of France isn't bald—there is no king of France!

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- Less clear when embedded in negation:

(69) Jija doesn't knows that it is raining—it isn't raining!

(70) The king of France isn't bald—there is no king of France!

- Metalinguistic negation.

(71) Sarah didn't eat some of the cookies—she ate all!

(72) We didn't buy po-tah-toes, we bought po-tay-toes.

Reference Failures

- Strawson: A sentence presupposes that all its parts have references.

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- A proper name presupposes that there is someone of that name.

(73) Sherlock Holmes is a London detective.
Sherlock Holmes is not a London detective.

(74) The king of France is bald.
The king of France is not bald.

Fringe Cases

(75) The gardener is the murderer.
∂ there is a gardener

(76) Finally, we have case where the gardener isn't the murderer.
They don't even have a garden!
~~∂ there is a gardener~~

Presupposition

Presupposition in Discourse

Presupposition in Discourse

Significance for Discourse

- If you are like Frege and all you care about is truth-conditions, then you may be happy already.
- You have a perfectly fine notion of meaning: a sentence s with presupposition p is true in all those circumstances where $p \wedge s$ is true.
- But if you are like me, you may wonder about what is the significance of presupposition for discourse?

Significance for Discourse

(77) The family of Dashwood had long been settled in Sussex. Their estate was large ... The late owner of this estate was a single man, who lived to a very advanced age, and who for many years of his life, had a constant companion and housekeeper in his sister.

- You learn something from this:

  → There is a family *Dashwood* and a place *Sussex*.

  → The Dashwoods have an estate.

  → The owner of the state has a sister.

Significance for Discourse

(77) The family of Dashwood had long been settled in Sussex. Their estate was large … The late owner of this estate was a single man, who lived to a very advanced age, and who for many years of his life, had a constant companion and housekeeper in his sister.

- You learn something from this:
  - → There is a family *Dashwood* and a place *Sussex*.
  - → The Dashwoods have an estate.
  - → The owner of the state has a sister.
- The presuppositions themselves are informative, not mere prerequisites.

Presupposition Reexamined (Stalnaker 1978)

- "presuppositions are what is taken by the speaker to be the COMMON GROUND of the participants in the conversation, what is treated as their COMMON KNOWLEDGE or MUTUAL KNOWLEDGE." (Stalnaker)

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- Interactive communication depends vitally on mutually known information.

(78) A: Jija is coming.
B: Who is Jija?

(79) A: Are you joining us?
B: For what? And who is us?

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B: For what? And who is us?

- Presuppositions can present information as if mutually known. If no-one complains, the presupposition is accommodated.

Presupposition in Discourse

- “the context on which an assertion has its ESSENTIAL effect is not defined by what is presupposed before the speaker begins to speak, but will include any information which the speaker assumes his audience can infer from the performance of the speech act.” (Stalnaker)

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- That is, to evaluate the truth-conditions of a sentence, you first must accommodate all presuppositions.

- So this discourse:

(80) Jija will bring his guitar.

- ...tells this story:

(81) There is Jija *and* he has a guitar *and* he will bring it.

Forward Cancellation?

- We saw that presuppositions cannot be cancelled backwards.
- But it seems now that we can sometimes cancel them forward.

Forward Cancellation?

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- But it seems now that we can sometimes cancel them forward.

(82) If Jija is bald, then Jija's son is bald.
∂ Jija has a son.

(83) If Jija has a son, then Jija's son is bald.
~~∂ Jija has a son.~~

- The fact that (82) has a presupposition whereas (83) does not is known as presupposition projection.

Bad News

- These cases break the easy idea that we just add presuppositions conjunctively.

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∂ Jija has a son.

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(84) If Jija is bald, then Jija's son is bald.
∂ Jija has a son.

(85) ✗ If Jija is bald, then Jija has a son and Jija's son is bald.
~~∂ Jija has a son.~~
✓ Jija has a son. If Jija is bald, then Jija's son is bald.

Bad News

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(85) ✗ If Jija is bald, then Jija has a son and Jija's son is bald.
~~∂ Jija has a son.~~
✓ Jija has a son. If Jija is bald, then Jija's son is bald.

(86) If Jija has a son, then Jija's son is bald.
✗ Jija has a son. If Jija has a son, then Jija's son is bald.

We want a systematic theory

of what presupposition is

and of how we accommodate presuppositions

and of when we need to accommodate a presupposition

Presupposition in Discourse

Presupposition in DRT

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Presupposition as Anaphora

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- Anaphora and presupposition are quite similar.

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(87) He is bald.
he $\approx$ some available x with *male*(x).

(88) The king of France is bald.
The king of France $\approx$ some available x with *king-of*(x, f).

Presupposition as Anaphora

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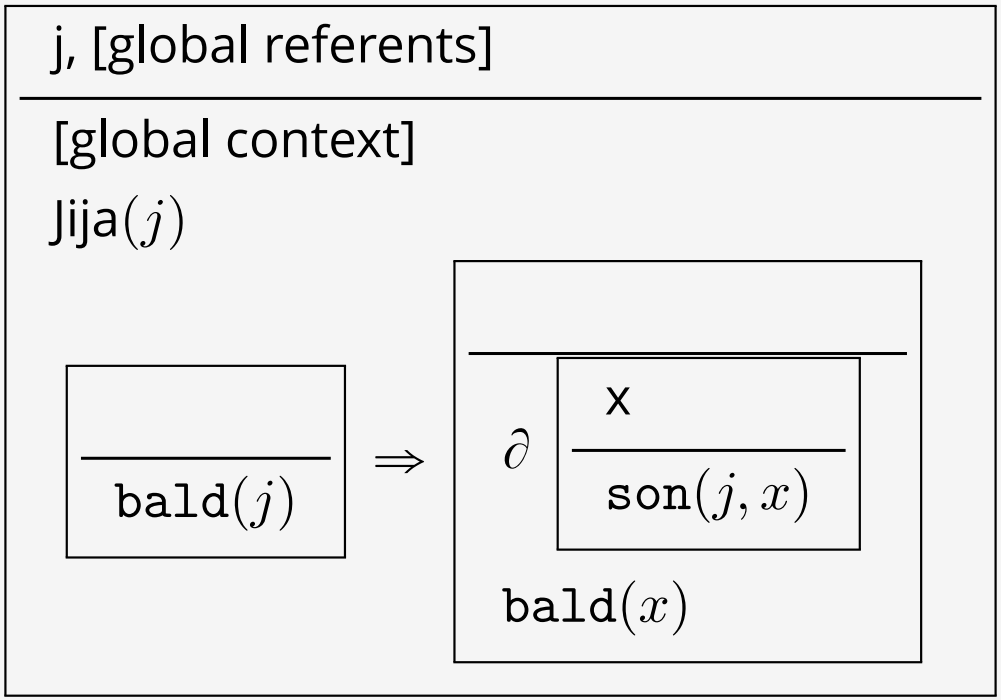
- When we do not need to accommodate, then the presupposition is bound like an anaphor (like in Donkey sentences).
- And an extra mechanism deals with accommodation when binding does not work out (like in Partee sentences).

Back to DRT

(89) There's Jija. If he's is bald, then his son is bald.
∂ Jija has a son.

– Say, when the construction algorithm encounters a presupposition trigger, we introduce the symbol ∂ into the DRS.



What to do with ∂

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- ∂ is not truth-conditionally evaluable, but a meta-symbol for the construction algorithm.
- First of all, resolve everything unresolved in the DRS under ∂ (including anaphora).
- Then, there are two ways to resolve presuppositions:
- Binding: recognising that the context entails the presupposed material.
- Accommodation: modifying the context such that it entails the presupposed material.

Binding

– Always prefer binding over accommodation. Thus:

Binding

When parsing $\partial\langle U, \mathit{Cons}\rangle$, first test all accessible DRSs K (in order of subordination). For each such $K' = \langle U', \mathit{Cons}'\rangle$:

– Let U'' be the set of all referents accessible to K'.

– Let $f : U \to U''$ be a function.

– Let $\mathit{Cons}'' = \mathit{Cons}' \cup \{u = f(u) \mid u \in U\}$.

– Let $K'' = \langle U'', \mathit{Cons}''\rangle$.

– Test whether $K'' \models_{\mathit{DRT}} C$ for all $C \in \mathit{Cons}$.

If it works out, delete $\partial\langle U, \mathit{Cons}\rangle$, but add $u = f(u)$ to K' for all $u \in U$.

Accommodation

- Else, accommodate.
- Accommodation means to just delete the ∂ in ∂K and take K as new information.

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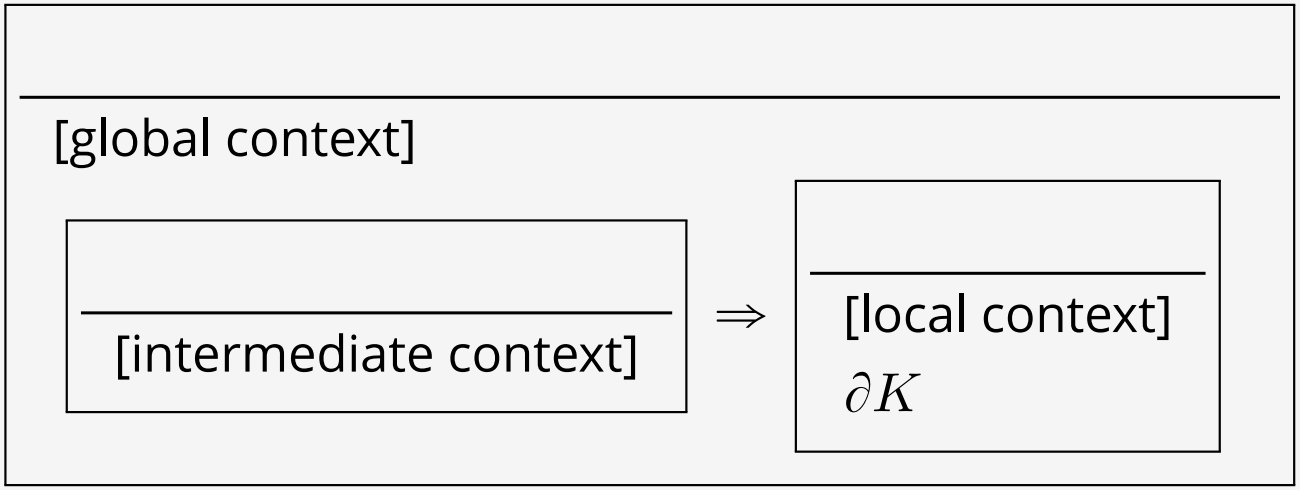

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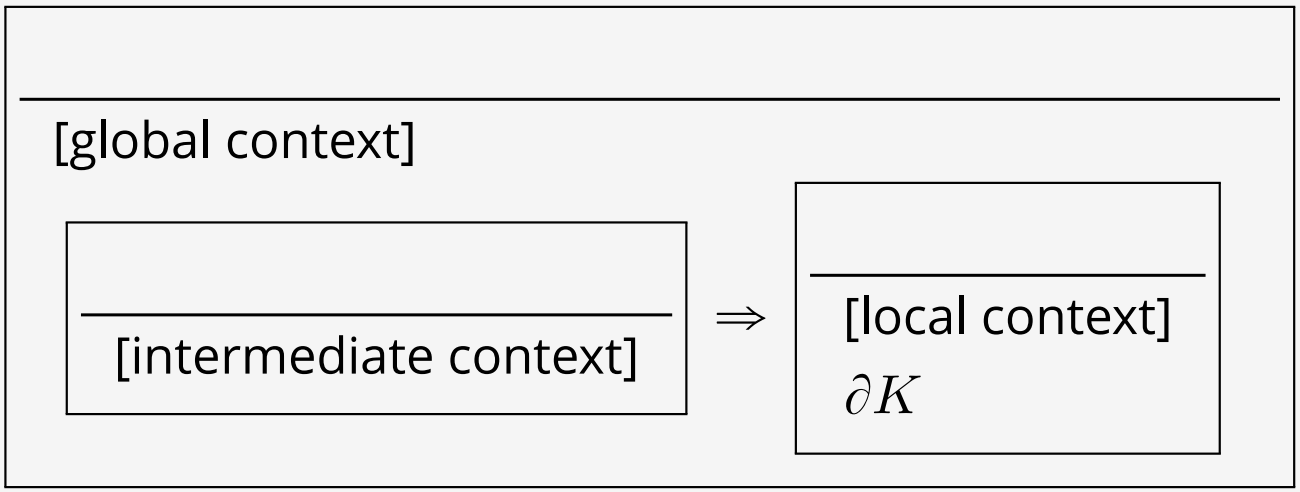
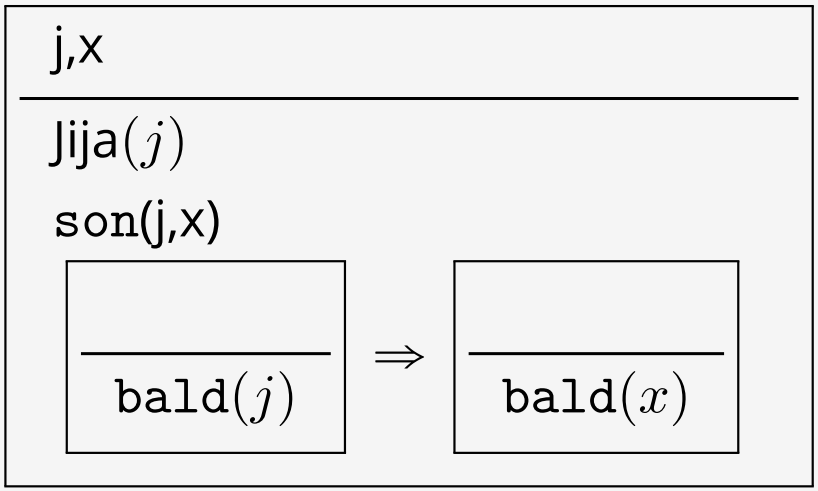


- All three can happen.

  → (In fact, all n where n is the number of accessible DRS.)

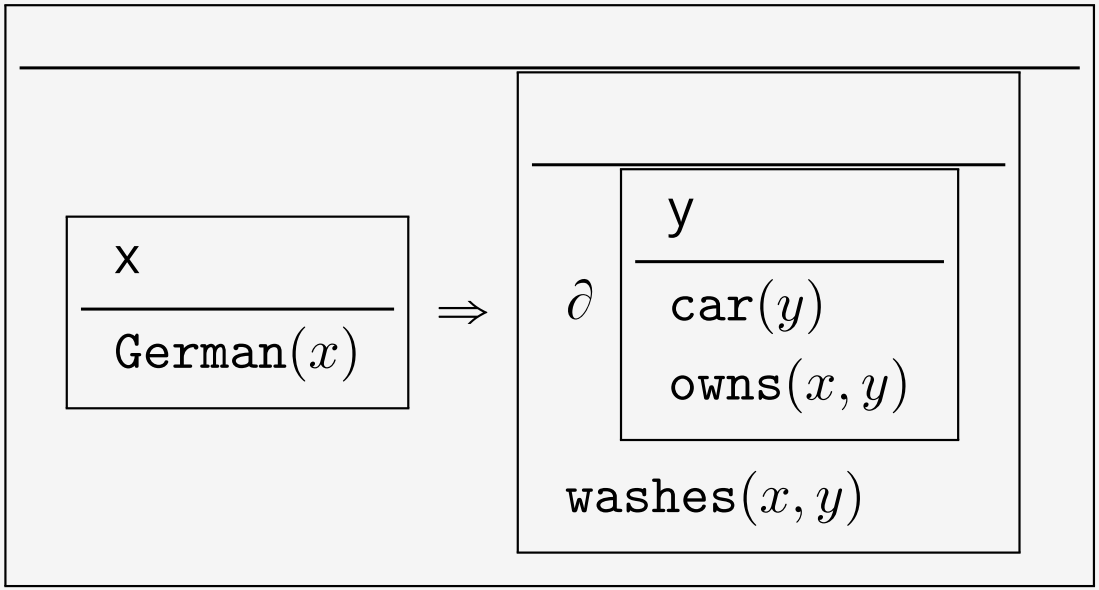
Global Accommodation

(90) If Jija is bald, then Jija's son is bald.



Intermediate Accommodation

(91) All Germans wash their cars.



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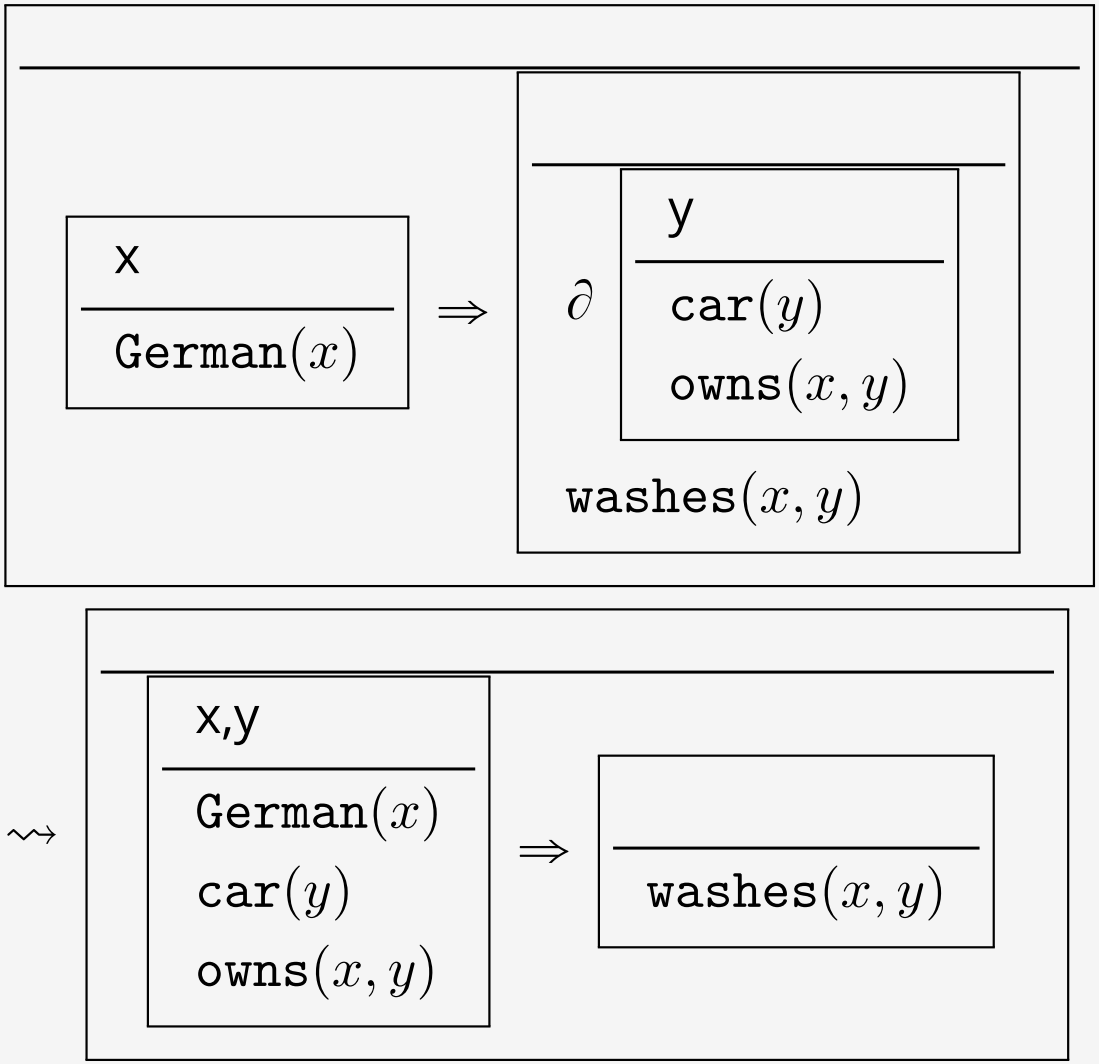
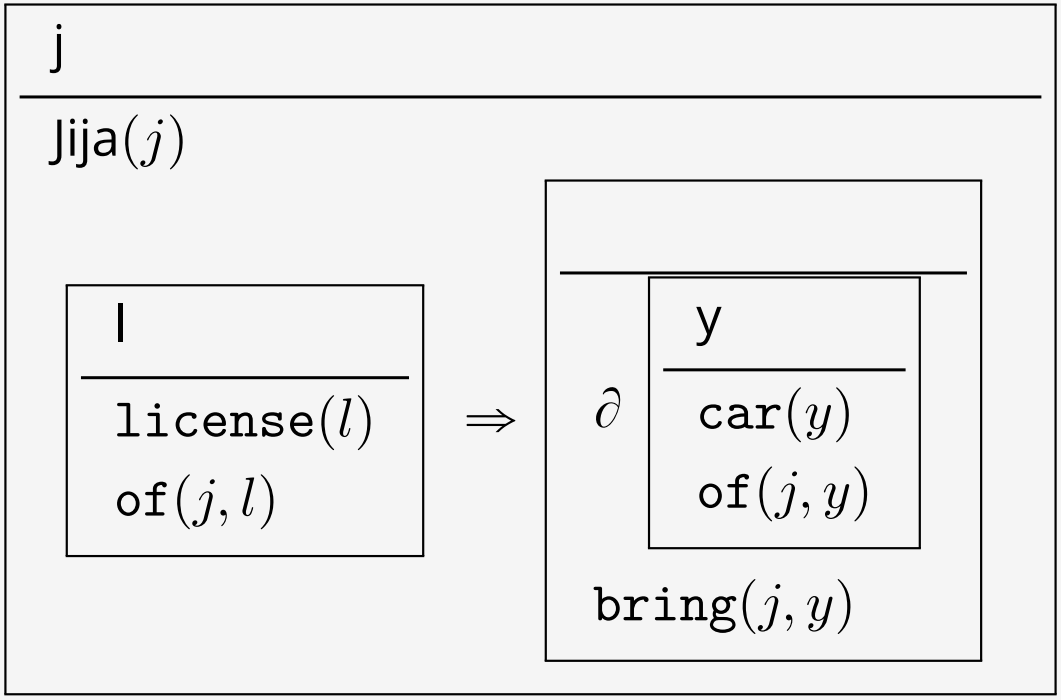


Local Accommodation

(92) If Jija got a driver's license, he will bring his car.



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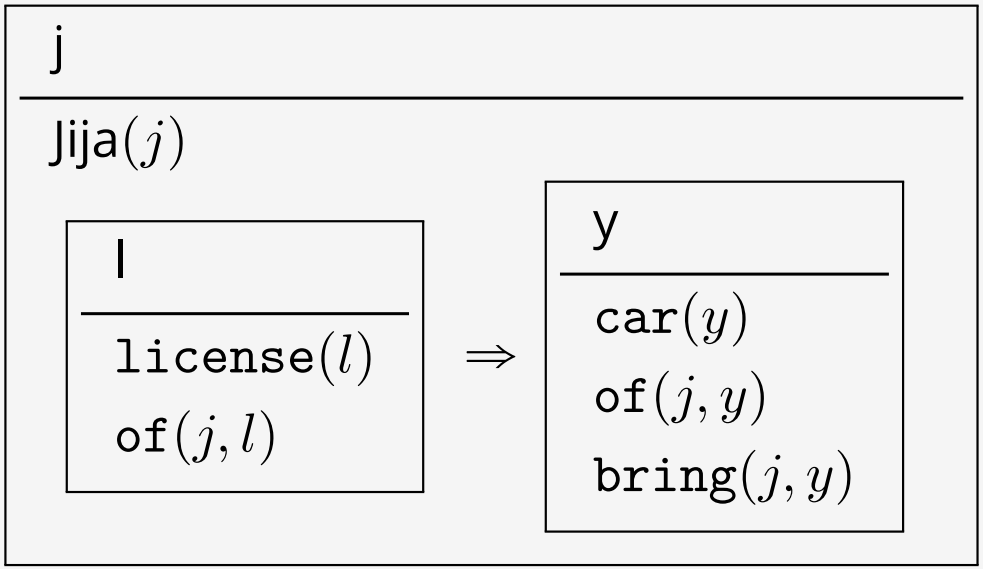

Accommodation Where?

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  → Involves introspective knowledge, deeper reasoning about coherence, reasoning about *degrees* of coherence...

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- But the consensus is this:

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Accommodated presuppositions are accommodated as globally as possible. That is, in the "highest up" DRS where it is consistent to do so.

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Principle of Global Accommodation

Accommodated presuppositions are accommodated as globally as possible. That is, in the "highest up" DRS where it is consistent to do so.

- Even in non-veridical contexts:

(94) Maria believes that Jija told her that Essun's wife is ill.

∂ Essun has a wife.

Accommodation

– Thus, simplifying somewhat, accommodate maximally global, restricted only by consistency.

Accommodation

Let $\partial\langle U, \mathit{Cons}\rangle$ be the DRS to be accommodated. Find the subordination-maximal DRS $K' = \langle U', \mathit{Cons}'\rangle$ that

– is accessible, and

– such that $\langle U' \cup U, \mathit{Cons}' \cup \mathit{Cons}\rangle$ is consistent.

Then modify K' to be $\langle U' \cup U, \mathit{Cons}' \cup \mathit{Cons}\rangle$.

– If this fails, stop the algorithm.

- Not quite right, but quite close to being right.

(95) Jija had an accident. #The car hit him.
Jija had an accident. ?The bus hit him.

Proper Name Puzzles...

- Recall:

(96) It is not the case that a man is running. #He takes his time.

(97) It is not the case that Jija is running. He takes his time.

(98) Either a man is having tea or ?he is having coffee.

(99) Either Jija is having tea or he is having coffee.

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(97) It is not the case that Jija is running. He takes his time.

(98) Either a man is having tea or ?he is having coffee.

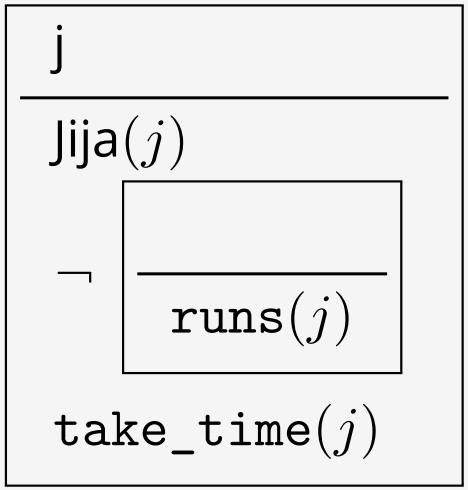
(99) Either Jija is having tea or he is having coffee.

- "Jija" triggers a presupposition that is bound or globally accommodated.

- So there are no problems with the anaphora.

...Resolved

(100) It is not the case that Jija is running. He takes his time.



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