Indexicals in dynamic semantics:
is a unified account possible?

Neither semantics nor cognition can be studied fruitfully on its own
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Indexicals

- Words whose meaning depends on context:
  - 1st and 2nd person pronouns:
    - I, you, we
  - Pronominal adverbs of location and time:
    - Here, there, now, then, yesterday, today, tomorrow
  - Demonstrative pronouns:
    - this, these, that, those
    - with a noun phrase (*this red car*) or without (*who is that?*)
  - 3rd person pronouns:
    - he, she, it, they
  - Other words (Partee 1989)
    - local, enemy, approach, etc.

Kaplan 1989

- Three-tier theory of meaning:
  - character(context) = content
  - content(world) = extension
- Indexicals are directly referential:
  - They denote a specific individual
  - Their value does not depend on the world of evaluation
- Context is a set of parameters:
  - agent (speaker), location, time, actual world, ...
- Prohibition of “monsters”:
  - In language, there are no operators altering the context

Dynamic semantics

- Motivation – problems in static semantics:
  - *Mary met **a student**.*
    - $\exists x\,(\text{student}(x) \wedge \text{meet}(m, x))$
  - ***He** needed help.*
    - $\text{need\_help}(x)$
  - We would like to get:
    - $\exists x\,(\text{student}(x) \wedge \text{meet}(m, x) \wedge \text{need\_help}(x))$
- Thus:
  - Dynamic semantics originated to solve the problem of indexicals (pronouns)

(3rd person) pronouns

- Pronouns have three different uses:
  1. Deictic (demonstrative):
     - ***He*** *is from Texas and* ***he*** *is from Alabama*
  2. Anaphoric:
     - *The teacher entered the classroom.* ***He*** *wasn't happy.*
  3. Bound:
     - *Everyone thought* ***he*** *was a hero*
- Kaplanian account:
  - An interpretation of 1 is substantially different from 2 and 3
- Dynamic semantics account:
  - A unified interpretation of all three uses

Dynamic semantics

- Takes into account:
  - Dependencies between sentences in discourse
  - Interpretation in the *context* of what was said before
  - Accumulation of information over time
- Sentence is an instruction which changes the context
- Context is the common ground:
  - Shared beliefs of the speaker and hearer
  - $\wedge\{p: B_s p \wedge B_s B_h p\}$ (and vice versa)
- But not only:
  - It is also a set of (available) discourse referents

Discourse referents

- Why are shared beliefs not enough?
  - *One of the ten marbles is missing.*
    ***It** is probably under the sofa.*
  - *Only nine of the ten marbles are in place.*
    *# **It** is probably under the sofa.*
- Discourse referents:
  - Represent entities in context
    - Can be introduced linguistically or extralinguistically
  - Correspond to real or hypothetical referents
    - a many-to-many relation
  - Can merge or split (unlike real referents)

File cards metaphor (Heim 1982)

- The task of the hearer:
  - keep up to date a mental file with all the information that was said up to the current point in time
  - a card in the file corresponds to a discourse referent
- The meaning of noun phrases is procedural
  - *"For every indefinite, start a new card; for every definite [incl. pronouns], update a suitable old card"* (Heim 1982:179)
- It is the whole file (context) that has truth-conditions
  - The file is true if it could be embedded in the model
  - Sentence meaning is context change potential

File of cards

- *Mary met **a student**:*

x
Mary (x)
meet (x, y)

y
student (y)
meet (x, y)

$\exists x, y\ (\text{Mary}(x) \wedge \text{student}(y) \wedge \text{met}(x, y))$

- ***He** needed help*

x
Mary (x)
meet (x, y)

y
student (y)
meet (x, y)
need_help (y)

$\exists x, y\ (\text{Mary}(x) \wedge \text{student}(y) \wedge \text{met}(x, y) \wedge \text{need\_help}(y))$

Discourse Representation Theory

- *Mary met a student. He needed help*
- Cards:

x
Mary (x)
meet (x, y)

y
student (y)
meet (x, y)
need_help (y)

$\rightarrow$

- Discourse Representation Structure (DRS, Kamp 1981):

x, y
Mary (x)
student (y)
meet (x, y)
need_help (y)

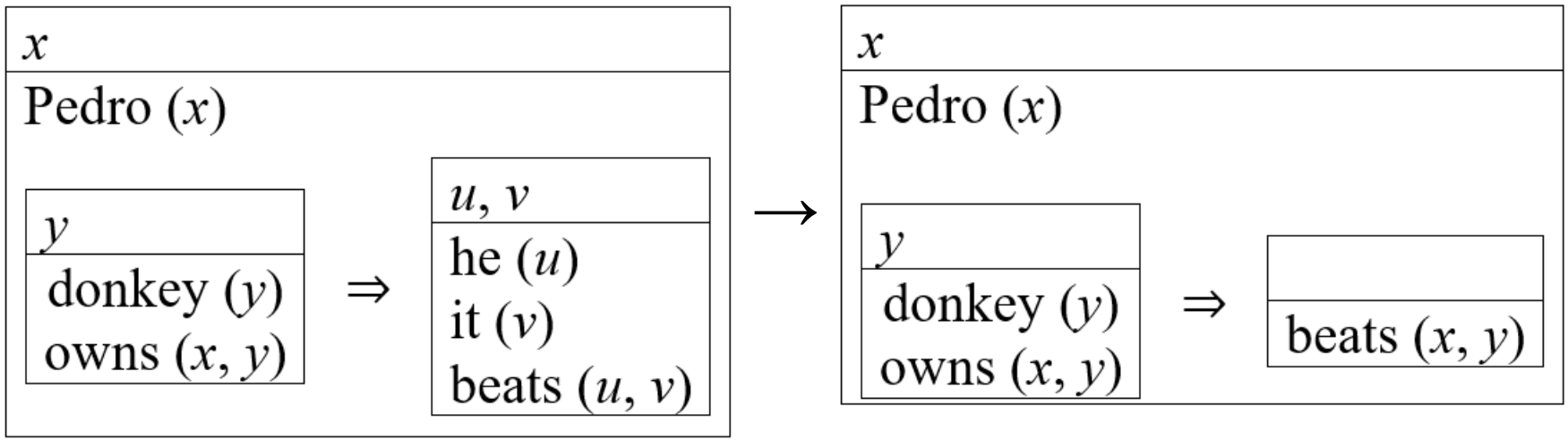
Represents the whole discourse,
aka context,
aka common ground

Contexts comparison

- Does common ground resemble Kaplan's context?
- Similarities:
  - Also stores parameters (discourse referents)
  - Includes information about the agent, time and place
  - Includes other information about the actual world
- Differences:
  - Information about the world is incomplete and can be false
  - Includes the content of the preceding discourse
    - The Principle of the Unity of the Context and Content (Kamp 1985)
  - Admits "unreal" referents by using nested *local contexts*

Structured context

- Nested DRSes (local contexts) are introduced for negation, implication, disjunction, etc.
  - *If Pedro owns a donkey **he** beats **it***



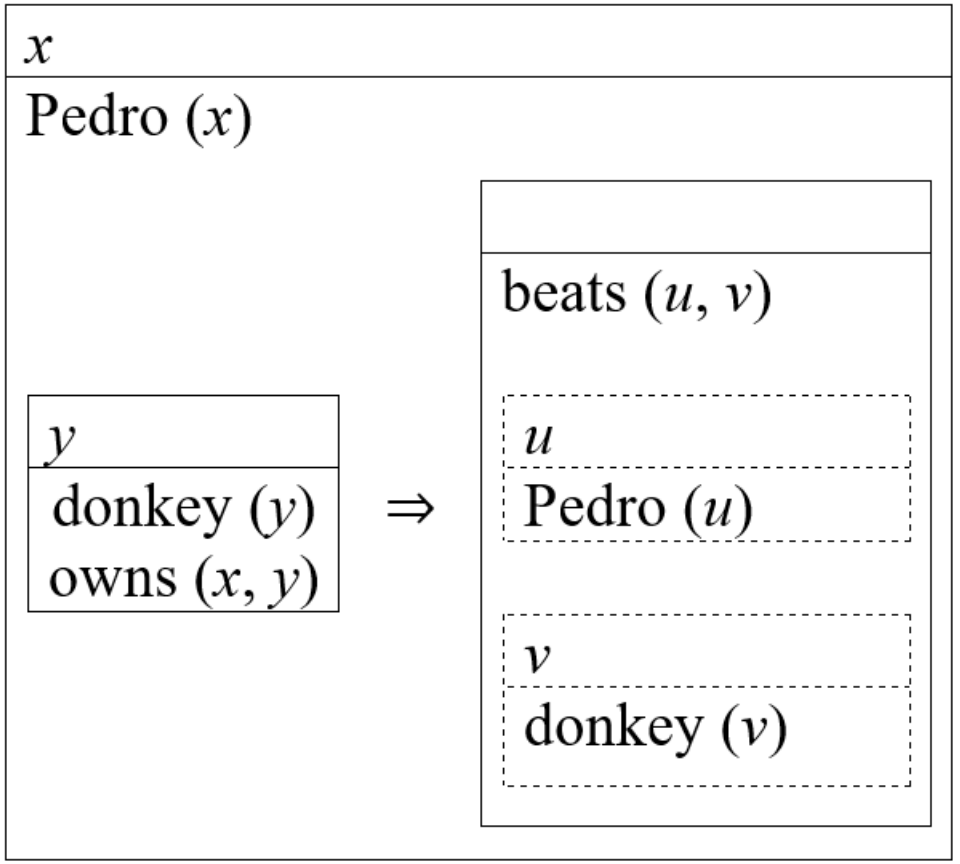
  - *he* and *it* search for their antecedents in the context
  - Both the main DRS and the local context of the premise of the implication are accessible for them

Unified processing

- Common rule for pronouns:
  - Find an antecedent (a suitable discourse referent) in the context
- Three different uses:
  - Deictic – if the found antecedent has been created extralinguistically (from perception)
  - Anaphoric – if the antecedent has been created by a linguistic expression and resides in the main DRS
  - Bound – if the antecedent resides in a nested DRS (local context)

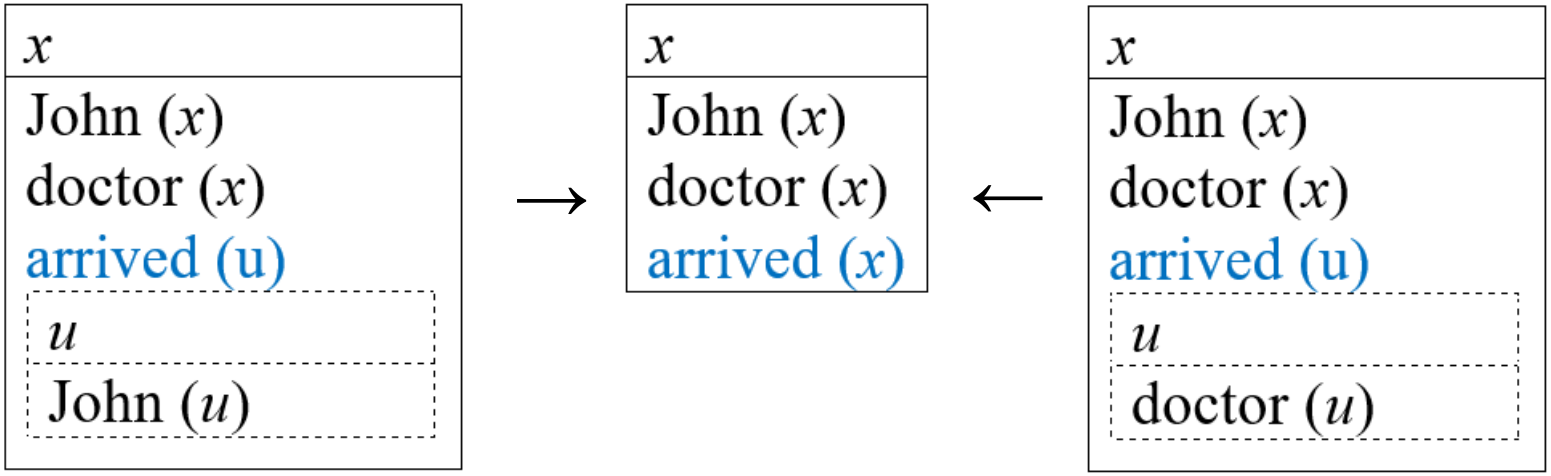
Not only pronouns

- The rule for pronouns has been extended to other referential expressions:
  - Definite descriptions and proper names
  - As a special case of presuppositions (van der Sandt 1992)
- *If Pedro owns a donkey,* ***Pedro*** *beats* ***the donkey***



Analogies with Kaplan

- Analogies:
  - Content of presupposition is an analogy of character
    - It is not a part of the proposition/assertion (what is said)
  - Found antecedent is an analogy of direct reference
    - Though it is a direct *discourse*-reference
- *John arrived* *The doctor arrived*



Rigid designators

- Interpreted in the same way (rigidly):
  - Pronouns
  - Proper names
  - Definite descriptions
- But descriptions are not rigid designators?
  - This is an erroneous generalization
    - In many cases descriptions show rigidity
  - Descriptions are still different from pronouns
    - In how they (do not) respond to the salience of discourse referents

Definite descriptions

- Three different uses of definite descriptions:
  - Referring – *The president arrived*
    - Including attributive (Donnellan 1966)
  - Predicative – *John is the president*
  - Generic – *The president is the head of the government*
- In addition, there are:
  - Complete (unique) descriptions, which carry uniqueness presupposition – *the king of France*
  - Incomplete descriptions – *the table* (Ramachandran 2008)
  - The latter usually cannot be used predicatively:
    - *John is ~~the~~ a doctor*

Names are incomplete descriptions

- Quotation theory (Geurts 1997)
  - John = the individual named ‘John’
    - ***Mary*** *is happy*
    - *I have a poodle named ‘Horace’.* ***Horace*** *is three years old*
    - *If a child is christened ‘Bambi’, then Disney will sue* ***Bambi****'s parents*
- The effects of rigidity are symmetric (Rygaev 2022):
  - *If Mary were called Gertrude [and had a friend called Mary], then* ***Mary*** *would be happy*
  - *If the teacher was a student instead [and took lessons from another teacher], then* ***the teacher*** *would be happy*

Definite descriptions

- Examples:
  - ***The president*** *might not have been* ***the president***
  - ***He*** *might not have been* ***him***
  - ***Mary*** *might not have been* ***Mary***
  - ***The doctor*** *might not have been* ***the doctor***
- Analysis:
  - The truth of the first sentence is related to the predicative use of *the president*
  - The predicative use is not available for the rest, hence their truth is questionable
  - The referring use demonstrates common behavior

Yet the difference (Roberts 2002)

- For pronouns, but not for descriptions, the salience (prominence) of the discourse referent is important
  - *A man entered. Then another man entered.*
    He *brought a cake / #* ***The man*** *brought a cake*
  - *I read the book and wrote to* ***the author*** *(# to* ***him****)*
- That explains the contrast:
  - Pointing at Paul from St. Paul. Charles is from Charleston.
  - *If Charles and Paul had changed chairs, then*
    a) ***he*** *would be from Charleston*
    b) ***the man being pointed at*** *would be from Charleston*

Demonstratives

- The use of *this* and *that* is similar to pronouns:
  - ***This*** *is a delicious food*
  - *…Then another man entered.* ***That man*** *brought a cake.*
  - *Every dog has an owner who thinks that* ***that dog*** *is a sweetie*
- Peculiarities:
  - They can express near-far contrast:
    - ***This picture*** *is better then* ***that picture***
  - They can simply express contrast:
    - ***He*** *will be sitting on* ***that chair****, and* ***he*** *will be sitting on* ***that chair***
    - *#* ***He*** *will be sitting on* ***the chair****, and* ***he*** *will be sitting on* ***the chair***

Roberts 2002

- Demonstratives require demonstration
  - But it can be implicit
  - And can be a constituent from the discourse
  - Discourse referents of the demonstrative and the demonstration must coincide
- Demonstration in the real world
  - For real-world demonstration, its discourse referent always corresponds to a referent from the real world
  - Because of that the antecedent of the corresponding demonstrative cannot be in a nested context

Demonstratives

- *If Charles and Paul had changed chairs, then*

  a) ***he*** *would be from Charleston*
  b) ***the man being pointed at*** *would be from Charleston*
  c) ***this man being pointed at*** *would be from Charleston*

- Hypothesis:
  - Demonstratives also respond to salience
  - Demonstration only makes the discourse referent salient
- There is still some difference from pronouns
  - *First square nine, then cube* ***it/that***

Here and now

- Now:
  - *I am happy **now***
  - *Pedro turned off the light. **Now** it was pitch dark.*
  - *Every student graduated from the university thinks that **now** life will be easier*
- Here:
  - *Come over **here***
  - *John got home. **Here** he felt safe.*
  - *Wherever we stopped on the road it always seemed to us that the best place was not yet **here***
- Analogies: *this/that, now/then, here/there*

Stojnić & Altshuler 2021

- Now is an anaphor:
  - It refers not to a time
  - But to the resulting *state* of a salient event
  - Onset of the event marked by *now* must overlap with that state
- Examples:
  - *They all flew out. The room was empty **now**.*
  - *The janitor turned off the lights. The room was empty **now**.*
  - *I hit him because he hit me*
  - *# I hit him because he **now** hit me*

I and you

- The only proper indexicals:
  - Interpreted almost exclusively deictically
  - Anaphoric or bound use – only in exceptional cases
  - Do not refer to linguistically introduced agents
- Examples:
  - *If I was my boss **I** would promote **me***
  - *Only I did **my** homework*
  - *# John$_i$ said that I$_i$ am a hero* (allowed in Amharic)
- Demonstratives?
  - *I/you* also form a pair analogous to *this/that*

Hunter & Asher 2005

- Mark presuppositions with special operators:
  - ↑ – preferable binding to the main DRS
    - for *here*, *now* and *actual*
  - ⇑ – exclusive binding to the main DRS
    - for *I* and *you*

Direct reference

- Presuppositions provide direct *discourse*-reference
  - But not direct reference
  - Discourse referents from DRS are interpreted existentially
  - In different worlds they can refer to different individuals (i. e. have different values)
- Is it possible to combine DRS with direct reference?
- And is it necessary?

Direct reference

- Kripke and Kaplan in DRT:
  - Zeevat 1999
    - External and internal (intensional) anchors
  - Maier 2009
    - Layered DRT – separate layer for Kripke and Kaplan
  - Hunter 2013
    - Separate level of DRS hierarchy

External anchors

- Kamp introduced external anchors (Kamp 1985)
  - for proper names (Kamp & Reyle 1993)
  - for extralinguistic entities (Kamp 1990)
- *That man is a crook*

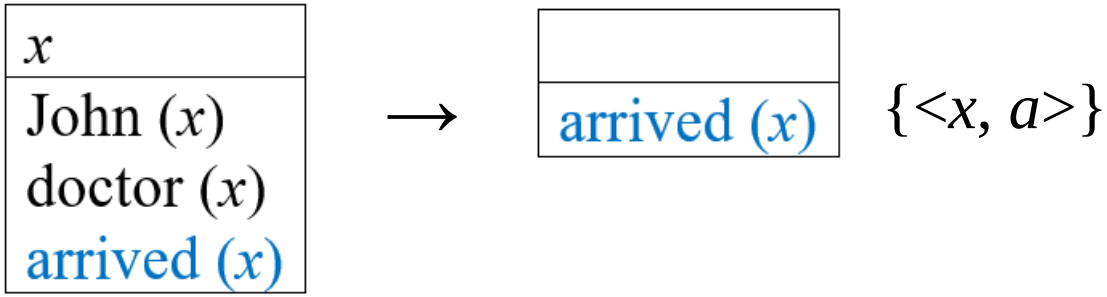
x
man (x)
visual_appearance (x)
crook (x)

$\{<x, a>\}$

- Anchors fix the interpretation of variables to specific individuals in the model

Zeevat 1999

- Indexicals are presupposition triggers
  - Processing an utterance adds the utterance itself to the DRS with its parameters
    - Agent, location, time
  - Indexicals find them as their antecedents
- Proposition is the difference between new and old DRS



  - Anchors are used to interpret free variables

External anchors problems

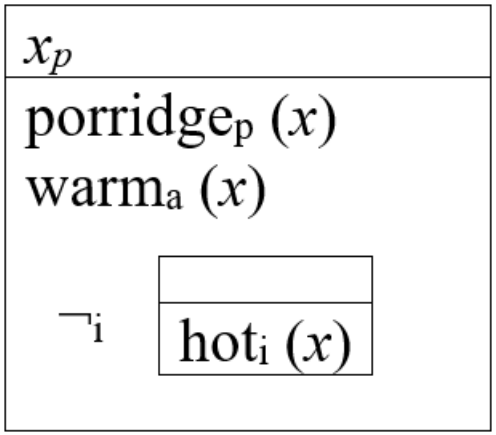
- External anchors are objects of intermediate nature
  - Foreign bodies in DRT
  - Require “God’s eye view”
- Agent can be mistaken
  - Can think that an object exists when it does not
  - Then we have no anchor and no proposition
  - But the thought in the mind is still meaningful
- Solution:
  - Intensional (internal) anchors

Internal anchors

- Internal (intensional) anchor:
  - A description associated with a discourse referent
  - Uniquely fixes an individual in the actual world
- Proposition:
  - A pointed model (with a distinguished world) is required
  - Anchors are interpreted in the distinguished world
  - Other conditions – in the world of evaluation
- Thought:
  - Everything is interpreted in the world of evaluation
- But Zeevat ignores nested contexts

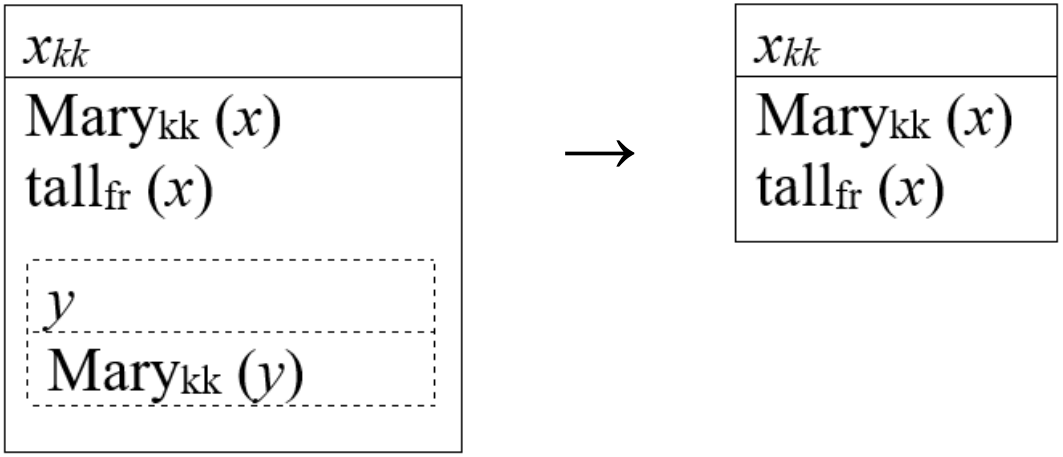
Maier 2009

- Layered DRT (Geurts & Maier 2003)
  - Inside DRS we can split information into different layers:
    - presuppositions
    - assertions
    - implicatures and so on
  - *The porridge is warm*



Maier 2009

- Names and indexicals are rigid presuppositions
  - Rigid designators are marked with kk layer
  - Other words – with fr layer
  - Presuppositions can search for their antecedents only in their own layer (Layer Faith rule)
  - *Mary is tall*

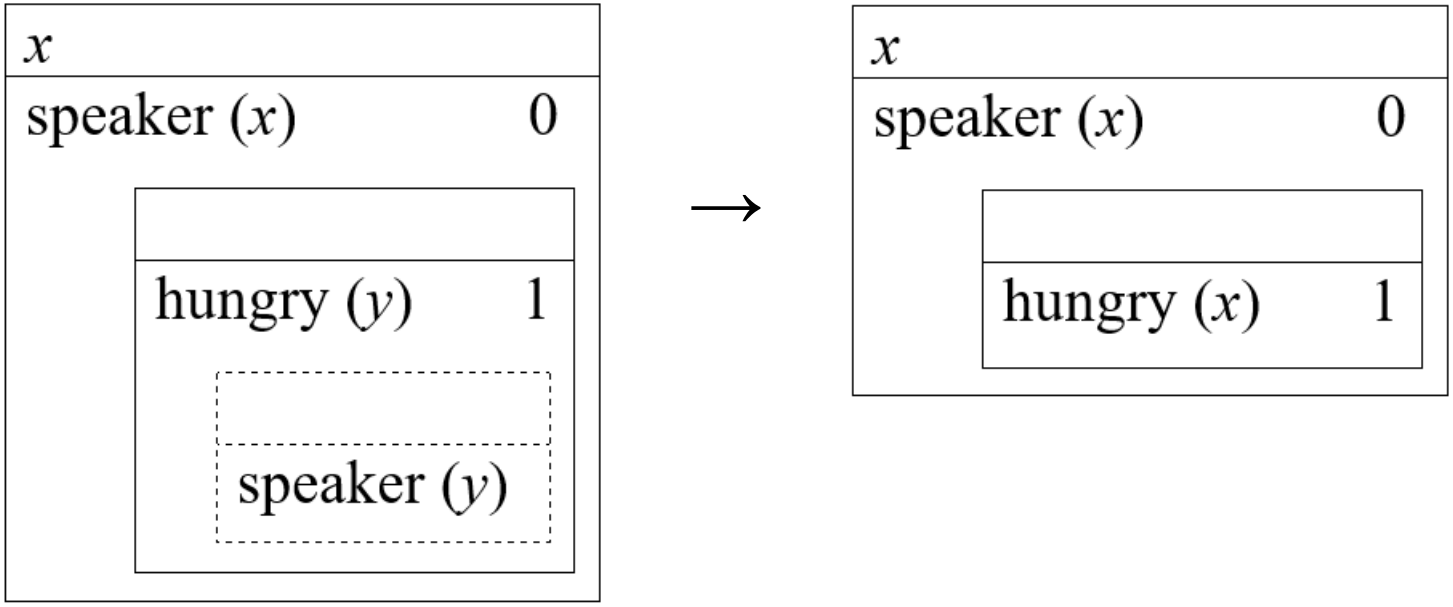


Maier 2009

- Interpretation:
  - kk layer is interpreted in Kaplanian context
  - fr layer – in the world of evaluation
- But: Layer Faith rule can be violated!
  - Names in nested contexts (kk → fr)
    - *I have a poodle called Horace$_{fr}$. **Horace**$_{kk}$ is three years old.*
  - Descriptions of salient individuals (fr → kk)
    - ***Biden**$_{kk}$ will give a speech*
    - ***The president**$_{fr}$ will give a speech*

Hunter 2013

- Extends context one level up:
  - Level 0 contains extralinguistic information and is interpreted in the distinguished world
  - Level 1 – linguistic information (in the world of evaluation)
  - *I am hungry*



Direct reference is not needed

- ***The doctor*** *arrived*

x
doctor (x)
arrived (x)

x
doctor (x)
everything_else_known_about (x)
arrived (x)

- Any arrived doctor validates the DRS on the left
  - Not just the one which was meant
- But the correct DRS is on the right
  - It contains all the old information, which usually includes unique properties (location-time etc.)
    - Then only one individual can validate that DRS

In other worlds

- Anchors lead to incorrect truth conditions
  - If there are individuals satisfying everything known
  - Then my DRS is true
    - Independent of their identity to the actual individuals
  - But anchors can make my DRS false
- In a counterfactual situation
  - We are not looking at a possible world through a telescope
  - We stipulate it (Kripke 1972)
  - I. e. we just stipulate which properties *that very individual* will have in the counterfactual “world”

Conclusions

- Indexicals are presupposition triggers
  - They search for an antecedent in a (possibly nested) context
    - Analogous to definite descriptions and proper names
  - Allow anaphoric and bound use
    - Except for *I* and *you*
- Direct reference is not needed
  - Our knowledge about a referent provides uniqueness of interpretation (an anchor)
    - And if it does not, then it should not
  - It also determines truth value in the world of evaluation
    - Adding external anchors can lead to wrong truth conditions

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Thank you for your attention!
Questions?