# Pragmatic path to semantics:

## Presupposition projection in Discourse Representation Theory

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# Discourse representation theory

- A theory of dynamic semantics (Kamp 1981, Kamp & Reyle 2013)
  - Semantic representation is constantly updating
    - Corresponds to the mental state of the hearer
  - Sentence meaning – context change potential
- Motivation:
  - Problems with anaphora in static semantics
    - A car appeared ∃x (car(x) ^ appeared(x))
    - It was black ∃x (car(x) ^ appeared(x) ^ black(x))
  - Interpretation of tenses
    - Past Simple vs Past Continuous in English

# Discourse representation theory

- *A woman was bitten by a dog*

| $x$, $y$ |
| --- |
| woman ($x$) |
| dog ($y$) |
| bit ($y$, $x$) |

- DRS (discourse representation structure) consists of:
  - Discourse referents (markers, variables)
  - Conditions (properties, predicates)
- DRS is a representation of the whole discourse

# Anaphora resolutions

- *A woman was bitten by a dog*
- *She hit it*

| *x, y, u, v* |
| --- |
| woman (*x*) |
| dog (*y*) |
| bit (y, *x*) |
| hit (*u, v*) |
| she (*u*) |
| it (*v*) |

| *x, y, u, v* |
| --- |
| woman (*x*) |
| dog (*y*) |
| bit (*y, x*) |
| hit (*u, v*) |
| ***u = x*** |
| ***v = y*** |

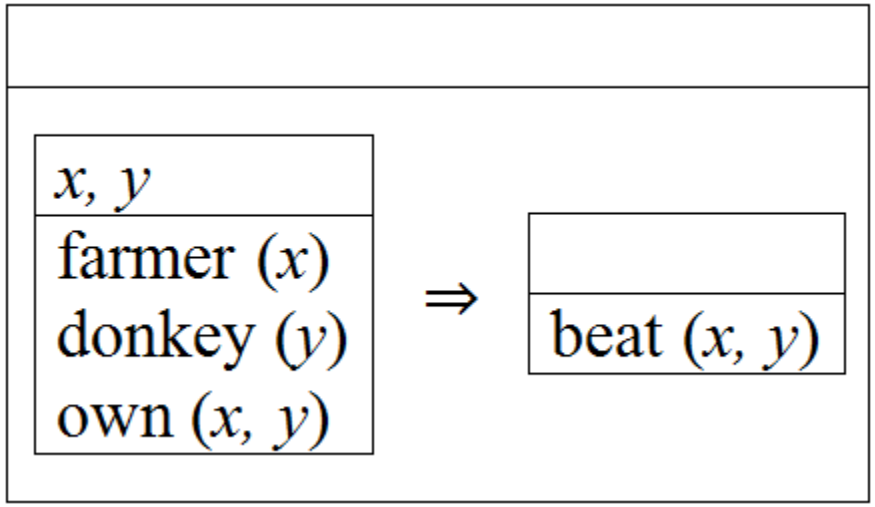
| *x, y* |
| --- |
| woman (*x*) |
| dog (*y*) |
| bit (*y, x*) |
| hit (*x, y*) |

# Interpretation in a model

- Truth conditions:
  - Applicable to the discourse as a whole
  - Not to a particular sentence
- DRS is true if:
  - There are individuals in the model corresponding to discourse referents from the DRS
  - who's properties and relations correspond to conditions from the DRS

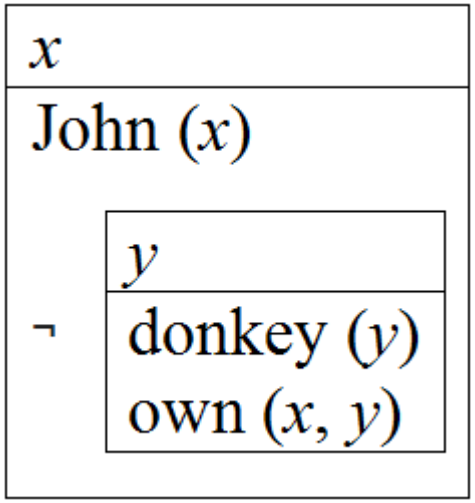
# Complex DRSs: implication

- *If a farmer owns a donkey he beats it*
- *Every farmer who owns a donkey beats it*



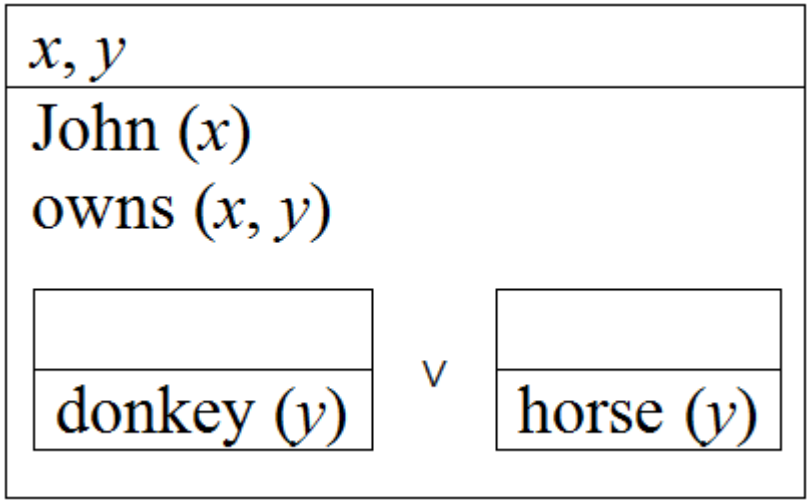
# Complex DRSs: negation

- *John owns no donkey*
- *John does not own a donkey*



# Complex DRSs: disjunction

- *John owns a donkey or a horse*

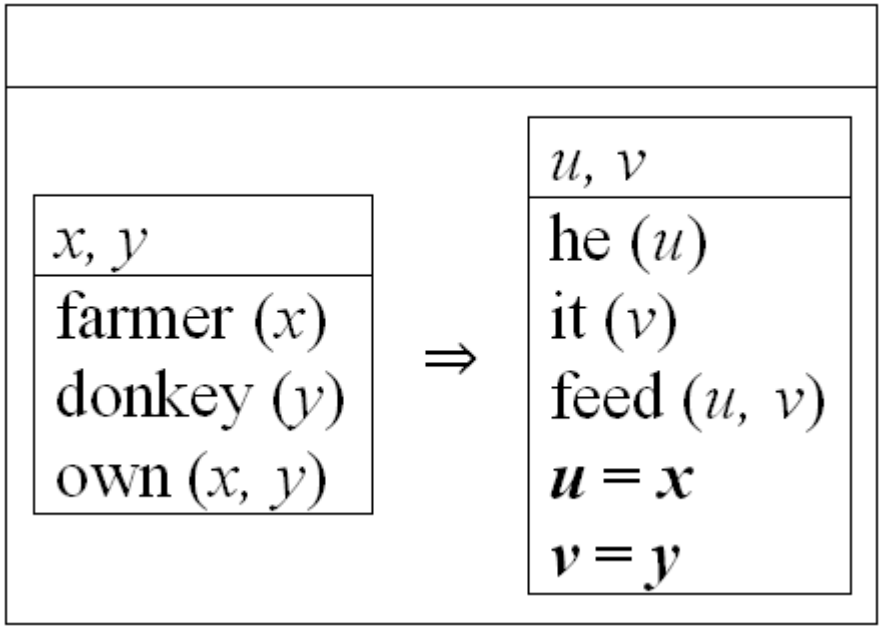


# Subordination and accessibility

- DRS B is subordinate to A if (informally):
  - B is embedded into A or
  - ‘A => B’ is a condition in some other DR or
  - B = A
- Accessibility
  - Discourse referent can (anaphorically) refer only to a discourse referent from a superordinate DRS
  - Others are not accessible for anaphoric links

# Subordination and accessibility

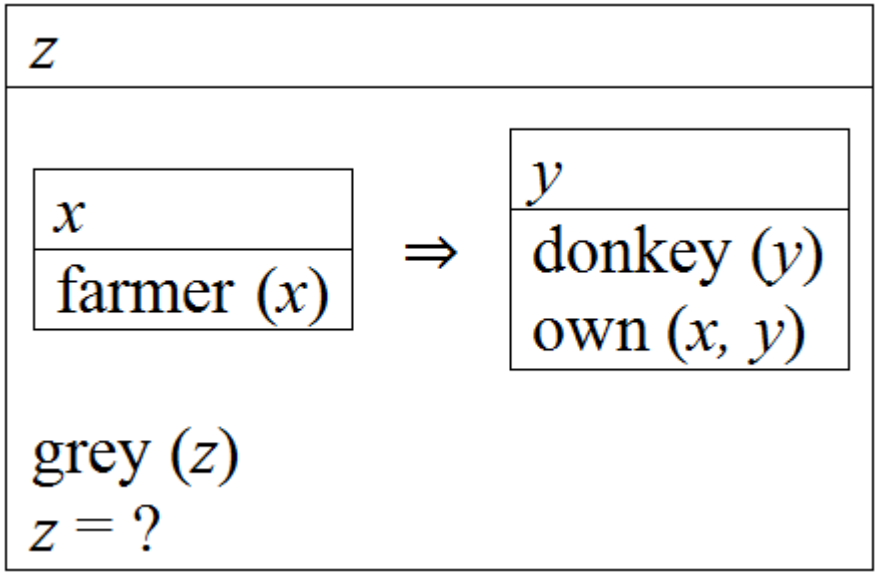
- *If a farmer owns a donkey, he feeds it*




- *x* and *y* *are accessible* for *u* and *v*, since they are located in a superordinate DRS

# Subordination and accessibility

- *Every farmer owns a donkey. *It is grey.*




- Neither *x*, nor *y* is accessible for *z*, since they are located in subordinate DRSs

# DRT advantages

- Allows the scope of (top level) NPs to be extended indefinitely
- Explains binding of anaphoric pronouns which are not syntactically bound
- Explains impossibility of anaphoric links where the antecedent is inaccessible

# Presupposition

- Presupposition is an information which the speaker linguistically marks as taken for granted
  - i.e. already known by the audience
  - i.e. constituting a part of the common ground

# Presupposition triggers

- Definite descriptions
  - *The king of France is bald*
  - *> There is a king of France*
- Complements of factive verbs
  - *John knows that the Earth is flat*
  - *> The Earth is flat*
- Clefts
  - *It was John who killed the butcher*
  - *> Somebody killed the butcher*
- Adverbs *even, too, again*, etc.

# Presupposition as anaphora

- Rob van der Sandt (1992) proposed that presupposition and anaphora is essentially the same phenomenon:
  - *Theo has a little rabbit and **his rabbit** is grey*
  - *Theo has a little rabbit and **it** is grey*
  - *If Theo has a rabbit, **his rabbit** is grey*
  - *If Theo has a rabbit, **it** is grey*

# Parallels

- VP-anaphora:
  - *If someone solved the problem it was Julius who* ***{solved it/did}***
  - *If Harry stopped smoking, John* ***{stopped/did}*** *too.*
- Sentential anaphora:
  - *If John is ill, Mary regrets* ***{that/that he is ill}***
  - *If John died, he did see his children before* ***{that/he did/he died}***

# Presupposition as anaphora

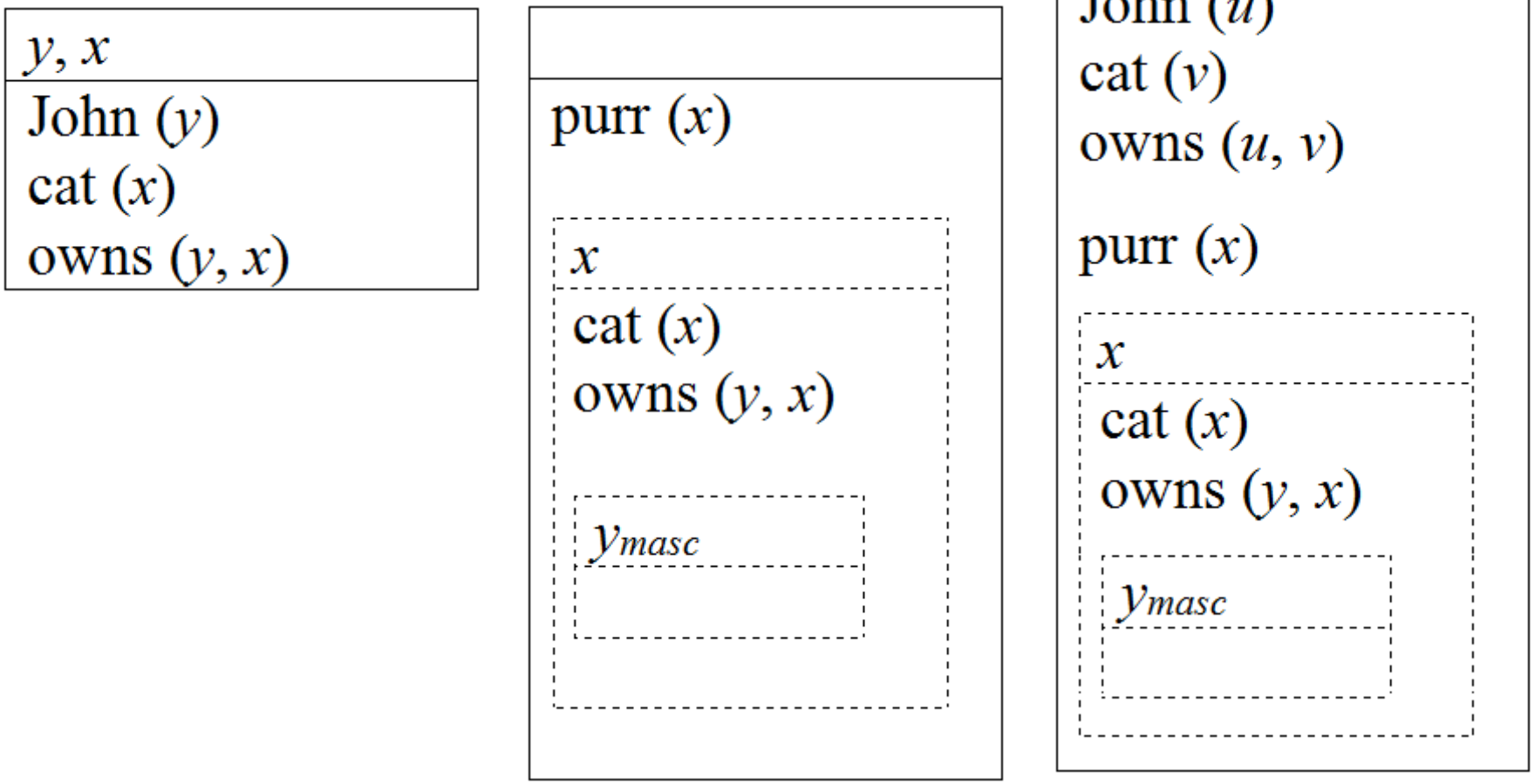
- Presuppositions are just anaphors
  - Can be treated by the same mechanism as anaphora resolution
- But unlike pronouns they contain descriptive content
  - They have internal structure that must be represented
  - They can be accommodated – if there is no antecedent found then the information can be just added to the DRS

# Presupposition projection in DRT

- First a separate sentence DRS (preliminary DRS) is built and only after that it is merged into the main DRS
- Anaphoric elements are encoded separately in a DRS
  - They are processed only after the sentence DRS is merged into the main DRS
  - In addition to discourse referents and conditions there is now an A-structure – a set of presuppositional A-DRSs
  - Presuppositional A-DRS can have its own A-structure, i.e. they can be embedded into one another

# Binding

- *John has a cat.* ***His cat purrs***



# Binding

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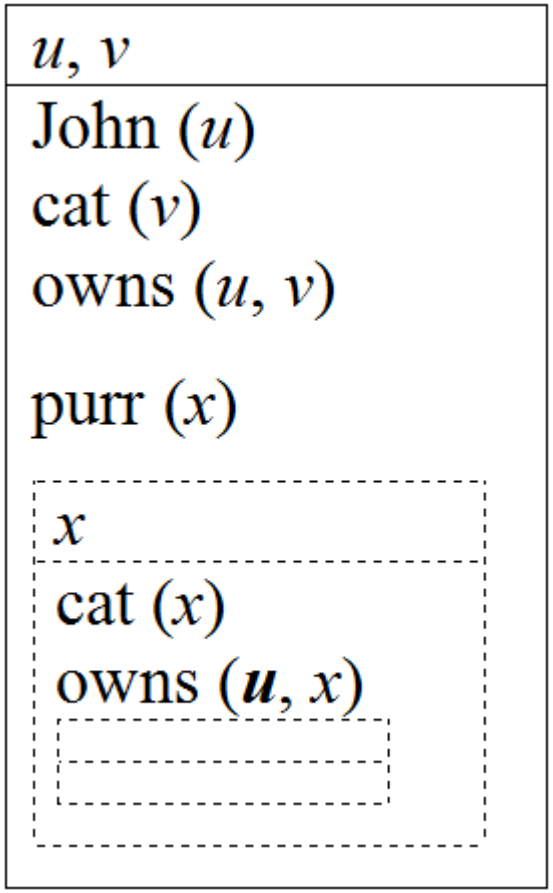
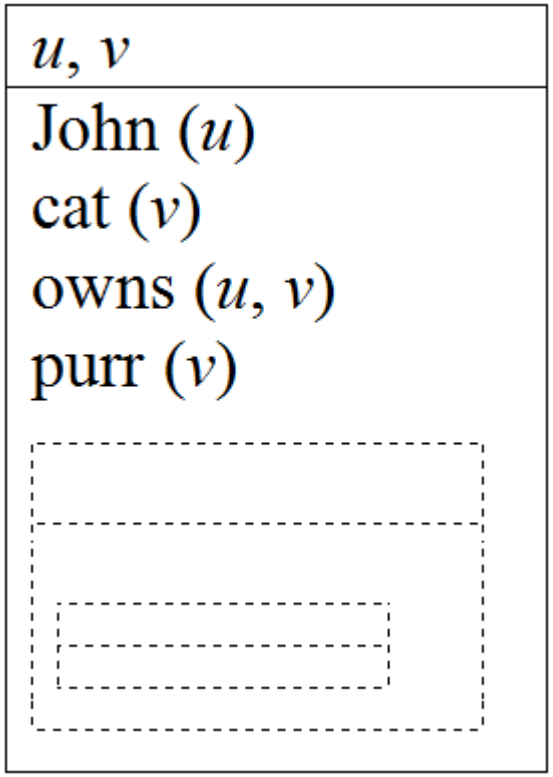
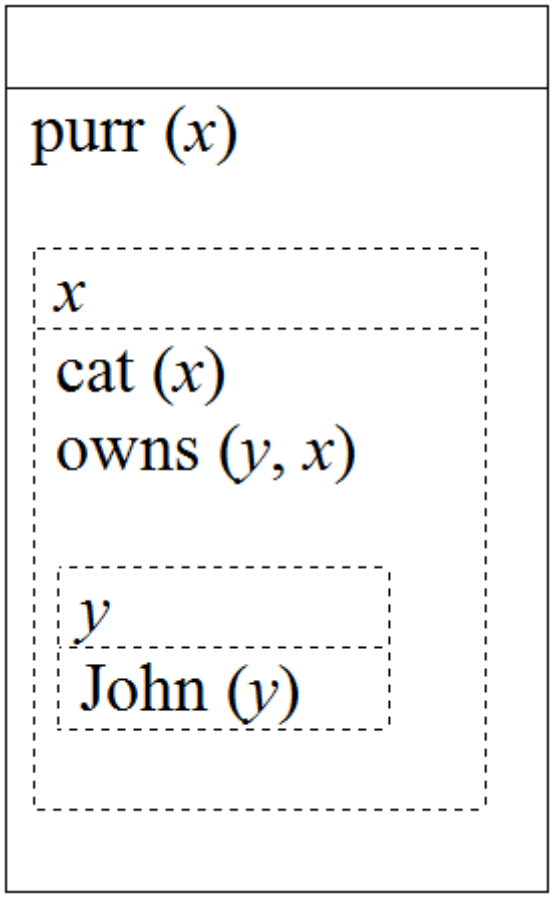
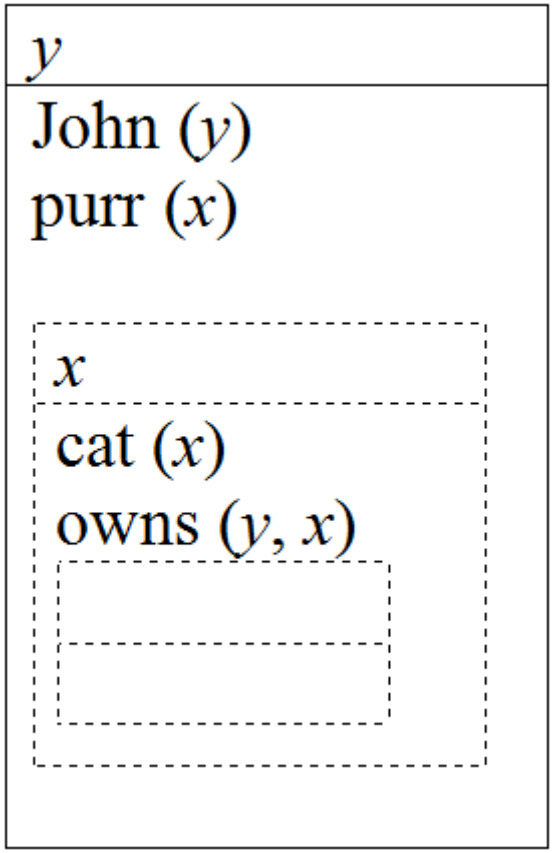


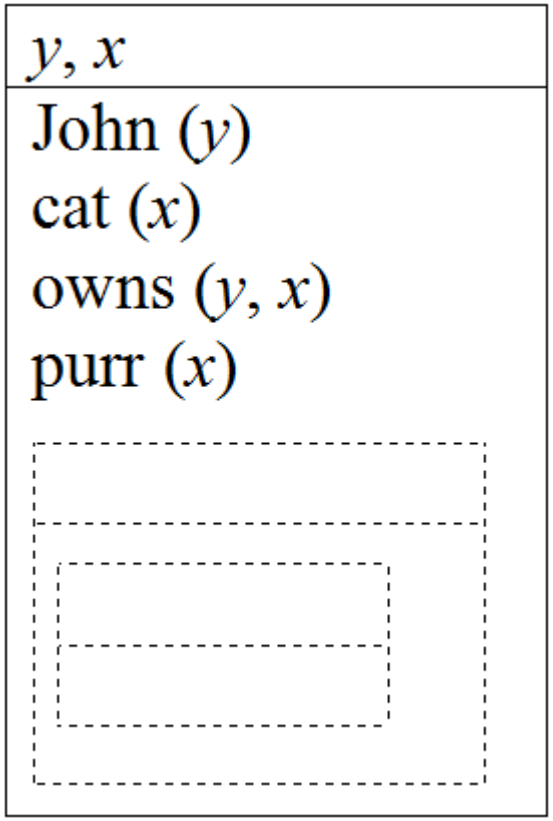



# Accommodation

- *John's cat purrs*

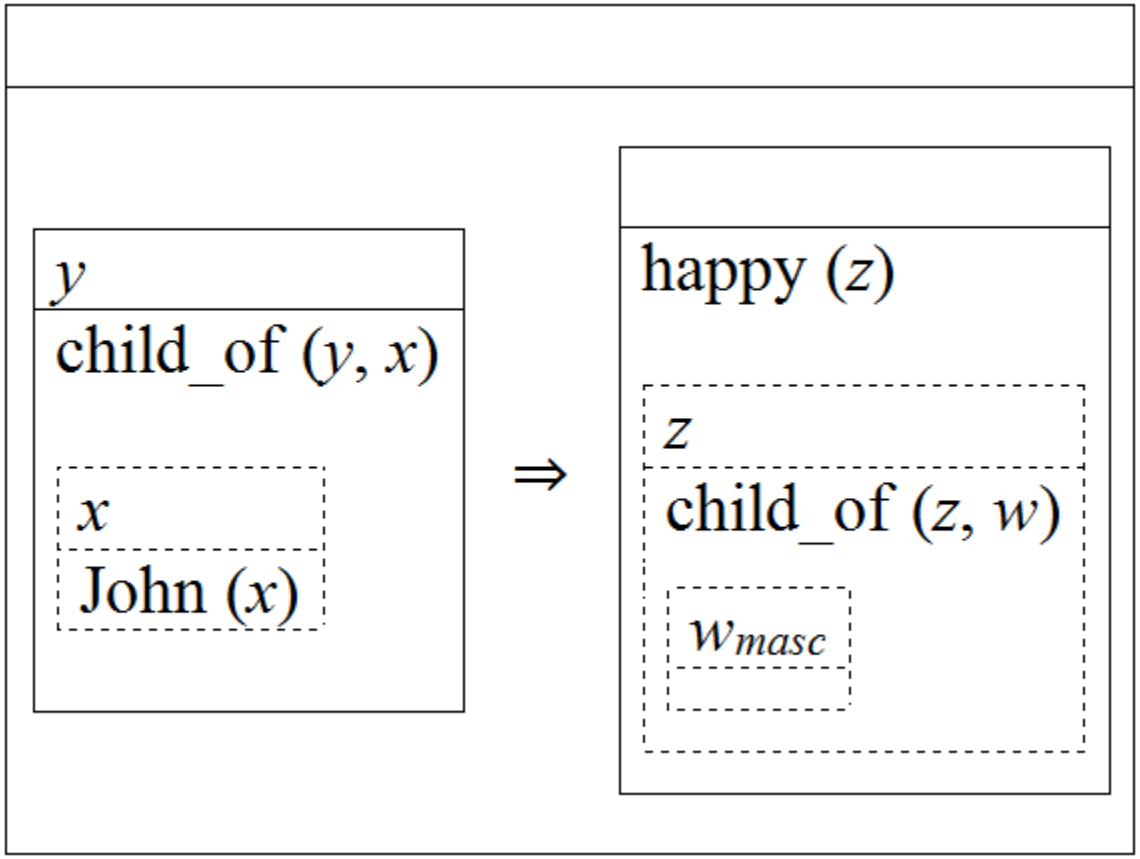


# Presupposition disappears

- *If John has a child, his child is happy*



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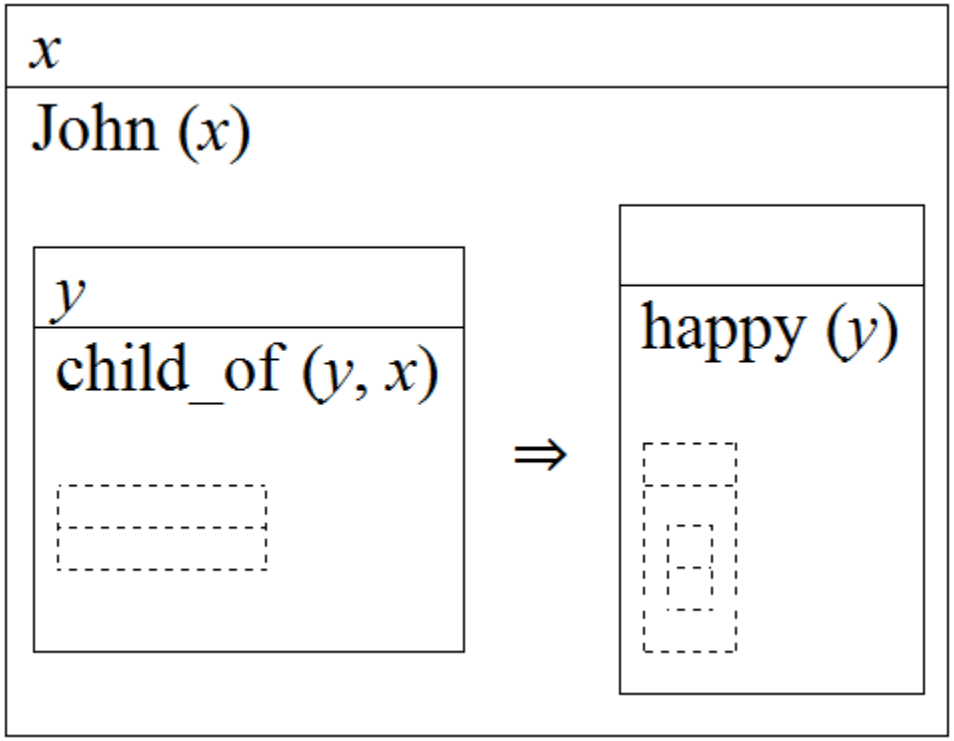


# Constraints on resolution

- General algorithm:
  - A-DRS goes up through hierarchy looking for an accessible and *admissible* antecedent
  - If not found, tries to accommodate at the top DRS (global accommodation)
  - If failed – goes back down, trying to accommodate locally where possible
  - Accommodation is also constrained by *acceptability*

# Acceptability

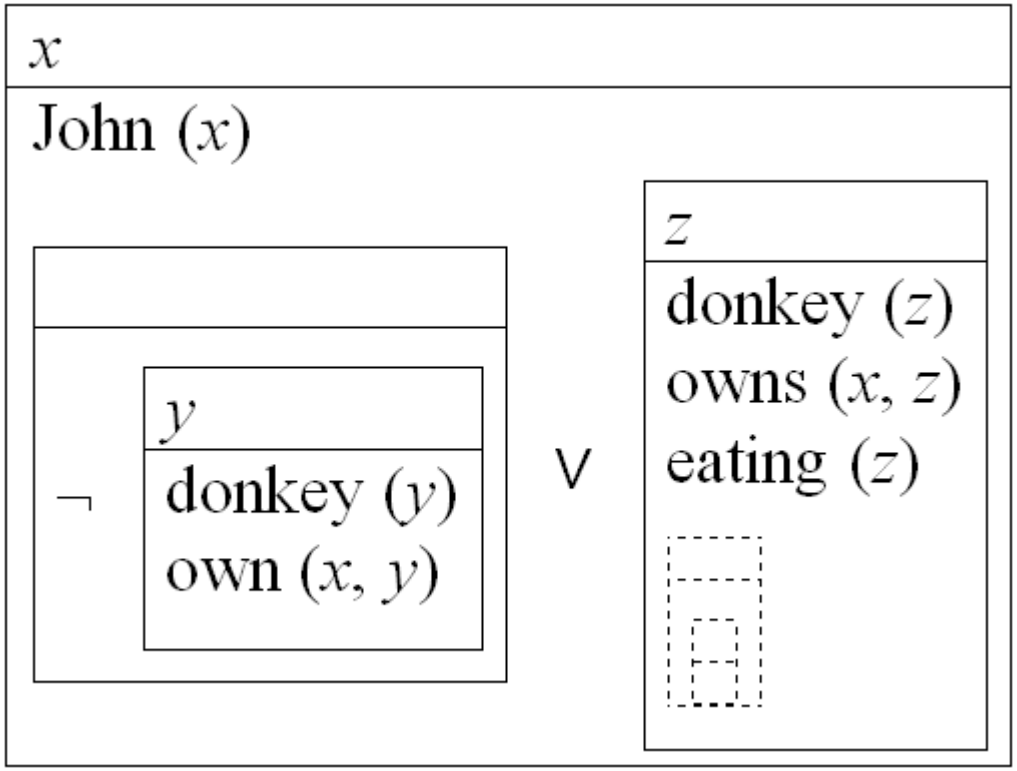
- Maxim of quality:
  - Main DRS must stay consistent
  - A subordinate DRS must not contradict a superordinate one
- Maxim of quantity:
  - New main DRS must be informative (must not logically follow from a previous one)
  - A subordinate DRS must be informative relative to a superordinate one (must not follow from it)
- Maxim of relevance:
  - Accommodated material must somehow be related to the context

# Acceptability violation

- Globally non-informative:
  - *John has a dog. John has a dog. John has a dog.*
  - *John managed to buy a dog. John has a dog.*
  - *John has a dog. Either he has a dog or he has a cat.*
- Locally non-informative or contradicting:
  - *John has a dog. If he has a dog, he has a cat.*
  - *John has a dog. If he has a cat, he has no dog.*
  - *John has no dog. Either he has a dog or he has a cat.*

# Acceptability example

- *Either John has no donkey or his donkey is eating quietly in the stable*



# Conclusions

- Classical view:
  - Pragmatics works after semantics
- DRT shows that this is not so:
  - Interpretable representation appears only after (and as a result of) the pragmatic mechanism of presupposition projection
  - But that is not all
  - The process of presupposition resolution is guided by the pragmatic maxims of Grice

# References

1. Kamp, H. (1981). A theory of truth and semantic representation. Methods in the Study of Language Representation.
2. Kamp, H., & Reyle, U. (2013). From discourse to logic: Introduction to modeltheoretic semantics of natural language, formal logic and discourse representation theory (Vol. 42). Springer Science & Business Media.
3. van der Sandt, R. A. (1992). Presupposition projection as anaphora resolution. Journal of semantics, 9(4), 333-377.

# Thanks for your attention!
# Questions?