Presuppositions (in DRT)

Week 10

Slides and materials based on the courses by
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Back to entailment

- Recall: sentence A entails sentence B (A ⊨ B) iff whenever A is true, then B must also be true

- Entailment is a relation between the *propositions* expressed by the sentences A and B:
  - *“John and Mary failed the test”* ⊨ *“Mary failed the test”*
  - *“John or Mary failed the test”* ⊨ *“someone failed the test”*
  - *“John is an intelligent student”* ⊨ *“John is a student”*
  - *“every student works”* ⊨ *“every blond student works”*

More examples of entailment?

- *“the mathematician who proved Goldbach’s conjecture wasn’t a man”*
  ⊨? *“someone proved Goldbach’s conjecture”*

- *“Mary doesn’t love her husband”*
  ⊨? *“Mary has a husband” / “Mary is married”*

- *“it wasn’t Mary who broke the typewriter”*
  ⊨? *“somebody broke the typewriter”*

- *“John kissed every girl at the party”*
  ⊨? *“there were girls at the party”*

Entailment vs. Presupposition

- Entailment:
  - *“Mary failed the test”* ⊨ *“Mary took the test”*
  - *“Mary didn’t fail the test”* ⊭ *“Mary took the test”*

- **Presupposition:**
  - *“the mathematician who proved Goldbach’s conjecture was a woman”*
    - ≫ *“someone proved Goldbach’s conjecture”*
  - *“the mathematician who proved Goldbach’s conjecture wasn’t a woman”*
    - ≫ *“someone proved Goldbach’s conjecture”*

What are presuppositions?

- **Definition 1:** A presupposition of a statement is a proposition that must be true in order for the statement to be interpretable (to make sense) in the first place

- **Definition 2:** A presupposition is an implicit assumption about the world whose truth is taken for granted by the speaker

Back to definite descriptions

- Definite descriptions convey *uniqueness*:

  “the chancellor decides”

  ↦ *“there is exactly one chancellor, and they decide”*

  ↦ $\exists x(\mathit{chancellor}(x) \wedge \forall y(\mathit{chancellor}(y) \leftrightarrow x = y) \wedge \mathit{decide}(x))$

- *“the chancellor”* ↦ $\lambda G.\exists x(\mathit{chancellor}(x) \wedge \forall y(\mathit{chancellor}(y) \leftrightarrow x = y) \wedge G(x))$
- *“the”* ↦ $\lambda F \lambda G.\exists x(F(x) \wedge \forall y(F(y) \leftrightarrow x = y) \wedge G(x))$

Definite descriptions and uniqueness

- This is a problem for compositionality, e.g.:

  "it is not the case that the chancellor decides"

- Compositional analysis of the sentence leads to:

  $\neg \exists x(chancellor(x) \wedge \forall y(chancellor(y) \leftrightarrow x = y) \wedge decide(x))$

  - *"Either there is no chancellor, or more than one, or there is exactly one chancellor and they do not decide"*
- But the correct representation should be:

  $\exists x(chancellor(x) \wedge \forall y(chancellor(y) \leftrightarrow x = y) \wedge \neg decide(x))$

  - *"There is exactly one chancellor, and they do not decide"*

Presupposition vs. Assertion

- A sentence (e.g. one containing a definite description) contains meaning information of (at least) two different types:
  - **Presupposition**: the requirements that the context must satisfy for the sentence to be interpretable
  - **Assertion**: the claims that are made (based on the context)

"the chancellor decides"

↦ *"there is exactly one chancellor, and they decide"*

↦ $\exists x(chancellor(x) \wedge \forall y(chancellor(y) \leftrightarrow x = y) \wedge decide(x))$

Presupposition projection

- Presuppositions are not affected by negation
  - Being in the syntactic scope of negation does not affect presuppositions
  - **Presupposition projection**: presuppositions are interpreted as if introduced outside the scope of the negation
    - We can use the property of projection to test for presuppositions.

"it is not the case that the chancellor decides"

↦ *"there is exactly one chancellor, and they do not decide"*

↦ $\exists x(chancellor(x) \land \forall y(chancellor(y) \leftrightarrow x = y) \land \neg decide(x))$

Examples of presupposition triggers

- Definite descriptions:
  - *“the king of France is bald”* ≫ *“there is a king of France”*
  - *“Mary doesn’t love her husband”* ≫ *“Mary has a husband”*
  - *“Mary’s brother didn’t buy a house”* ≫ *“Mary has a brother”*

- Universal quantifiers:
  - *“John kissed every girl at the party”* ≫ *“there were girls at the party”*

Examples of presupposition triggers

- Factive verbs (*“regret”*, *“realize”*, *“love”*, *“hate”*, *“be aware”*, etc.)
  - *“John regrets that Pola is married”* ≫ *“Pola is married”*
  - *“John realized that he was in debt”* ≫ *“John was in debt”*

- Implicative verbs (*“manage to”*, *“forget to”*, …)
  - *“John forgot to close the door”* ≫ *“John intended to close the door”*
  - *“John managed to close the door”* ≫ *“John tried to close the door”*

Examples of presupposition triggers

- Aspectual verbs and items:
  - *“John has stopped smoking”*
    ≫ *“John doesn’t smoke anymore”*
  - *“John used to fly with Lufthansa”*
    ≫ *“John doesn’t fly with Lufthansa anymore”*

- It-clefts:
  - “it was John who ate the cake”
    ≫ “somebody ate the cake”

More presupposition projection

- Presuppositions not only “survive” negation, but also other kinds of embeddings:
  - *“the chancellor or the ministers decide”*
    ≫ *“there is a (exactly one) chancellor”*
  - *“John possibly regrets that Mary is married”*
    ≫ *“Mary is married”*
  - *“Mary believes that John has stopped smoking”*
    ≫ *“John used to smoke”*

Presupposition filtering

- There are contexts that can “neutralise” or ***filter*** some presuppositions—they block projection of these presuppositions:
  - *“if John is out of town, then his wife is unhappy”*
    ≫ *“John has a wife” / “John is married”*
  - *“if John is married, then his wife is unhappy”*
    ≫ ~~*“John is married”*~~
  - *“if John is married, then his daughter is unhappy”*
    ≫ *“John has a daughter”*

Presupposition cancellation

- In the context of negation, presuppositions can be overwritten or “cancelled” by explicitly claiming that they are false:
  - *“John doesn’t regret that Mary is married. In fact, Mary has no husband, and John knows that.”*
  - *“It’s not the case that the king of France is bald. France is a republic.”*

- Presuppositions are also cancelled when what is said, taken together with background assumptions (i.e. relevant world knowledge), is inconsistent with what is presupposed:
  - *“John cried before finishing his thesis”* ≫ *“John finished his thesis”*
  - *“John died before finishing his thesis”* ≫ ~~*“John finished his thesis”*~~

Presupposition cancellation: theoretical questions

- **The Projection Problem**: under what conditions does a sentence containing a presupposition trigger inherit this presupposition?

- **Presuppositions and Compositionality**: how can we explain the presuppositions of complex sentences in terms of the presuppositions of their parts?

Summary

- Presuppositions are triggered by a number of different words and linguistic constructions, including definite noun phrases

- Presuppositions behave differently than assertions in semantics construction: they are typically projected unchanged, rather than used in functional application

- Projected presuppositions can be filtered in the semantic composition process, and can be cancelled by contextual knowledge

Presuppositions and Anaphora

- Parallelism between **pronoun resolution** and **presuppositional filtering**

- Pronoun resolution:
  - *“John owns a donkey. He beats it.”*
  - *“If John owns a donkey, he beats it.”*
  - *“Either John does not own a donkey or he beats it.”*

- Presuppositional filtering:
  - *“Jack has children. All of Jack's children are bald.”*
  - *“If Jack has children, then all of Jack's children are bald.”*
  - *“Either Jack has no children or all of Jack's children are bald.”*

Presuppositions and Anaphora

- Presuppositions are anaphors, i.e. they want to bind to previously established discourse referents (van der Sandt, 1992)
  - *“Pedro owns a donkey. Jane knows {it / that Pedro owns a donkey}”*
  - *“if Pedro owns a donkey, Jane knows {it / that Pedro owns a donkey}”*

- Crucial difference between presuppositions and pronouns:
  - If a pronominal anaphor does not find a proper antecedent, interpretation of the sentence fails
  - If a presuppositional anaphor does not find a proper antecedent, its information is ***accommodated*** (added to the information state)
    - ***“they are all bald”*
    - *“all of Jack's children are bald”*

Presuppositions in DRS: basic principles

- Introduce **α-DRSs** as a new type of complex condition

- DRS construction proceeds in two steps:
  (i) The construction rules for definite noun phrases introduce α-DRSs—this yields a “proto-DRS”
  (ii) The α-DRSs are resolved by means of binding and accommodation—this translates a proto-DRS into a standard DRS (with a model-theoretic interpretation)

Syntax for proto-DRSs

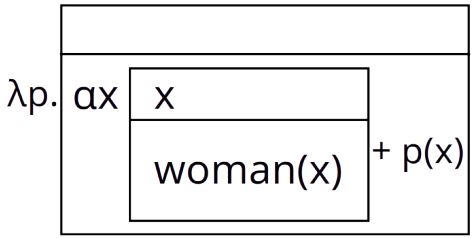
- **Proto-DRS**: a triple (U_K, C_K, A_K) such that:
  - U_K is a set of discourse referents
  - C_K is a set of (atomic or complex) conditions
  - A_K is a set of “anaphoric” (α-)DRSs of the form α*z*K', where *z* is a discourse referent and K' is a proto-DRS

- A DRS is a proto-DRS (U_K, C_K, A_K) with $A_K = \varnothing$

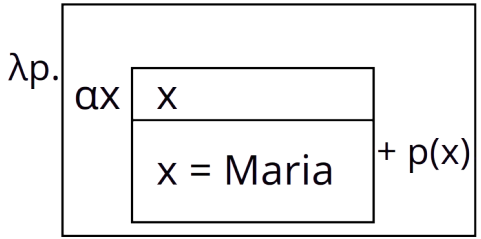
Definite Noun Phrases in DRT

- The DRS construction rules for all definite noun phrases introduce α-DRSs:

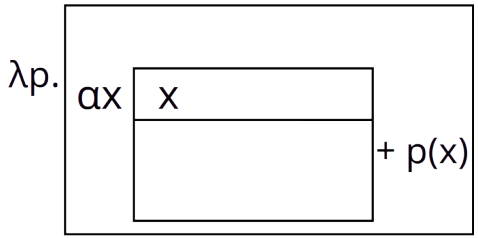
Definite descriptions (*"the woman"*):



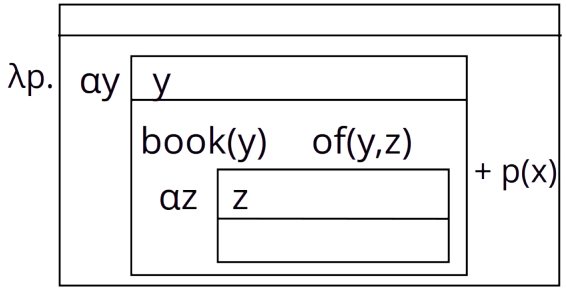
Proper names (*"Maria"*):



Pronouns (*"she"*):



Possessives (*"his book"*):



Recap: DRS subordination

- DRS K_1 is an **immediate sub-DRS** of a DRS $K = (U_K, C_K)$ iff
  - C_K contains a condition of the form: $\neg K_1$, $K_1 \Rightarrow K_2$, $K_2 \Rightarrow K_1$, $K_1 \vee K_2$ or $K_2 \vee K_1$

- DRS K_1 is a **sub-DRS** of DRS K (notation: $K_1 \leq K$) iff
  - $K_1 = K$, or
  - K_1 is an immediate sub-DRS of K, or
  - there is a DRS K_2 such that $K_1 \leq K_2$ and K_2 is an immediate sub-DRS of K

- DRS K_1 is a **proper sub-DRS** of DRS K iff
  - $K_1 \leq K$ and $K_1 \neq K$

Resolution by binding

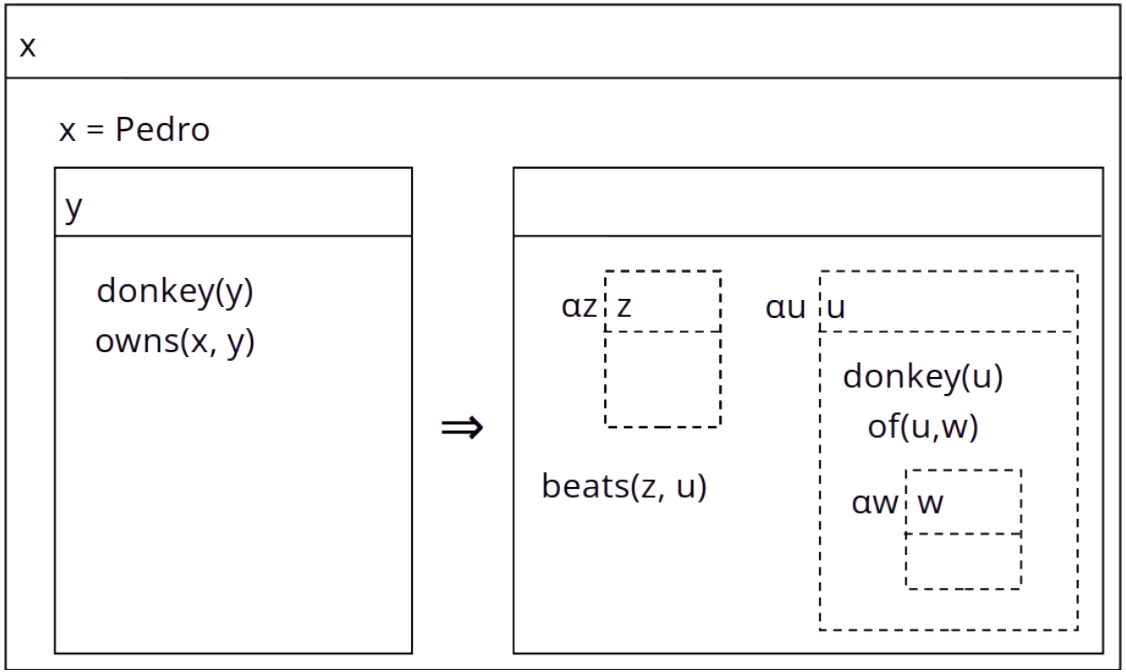
- Let K, K', K_t be some DRSs such that $K' \leq K$, $K_t \leq K$, and:
  - $\eta = \alpha x K_s \in A_{K'}$ (K_s is α-free)
  - $y \in U_{Kt}$ is a discourse referent that is accessible and suitable for η

- **Binding**:
  - $A_{K'} \leftarrow A_{K'} - \{\eta\}$
  - $U_{Kt} \leftarrow U_{Kt} \cup U_{Ks}$
  - $C_{Kt} \leftarrow C_{Kt} \cup C_{Ks} \cup \{x = y\}$

- Note: because K_s must be α-free, complex α-DRSs are always resolved from the inside out

Resolution by binding: example

“if Pedro owns a donkey, he beats his donkey”



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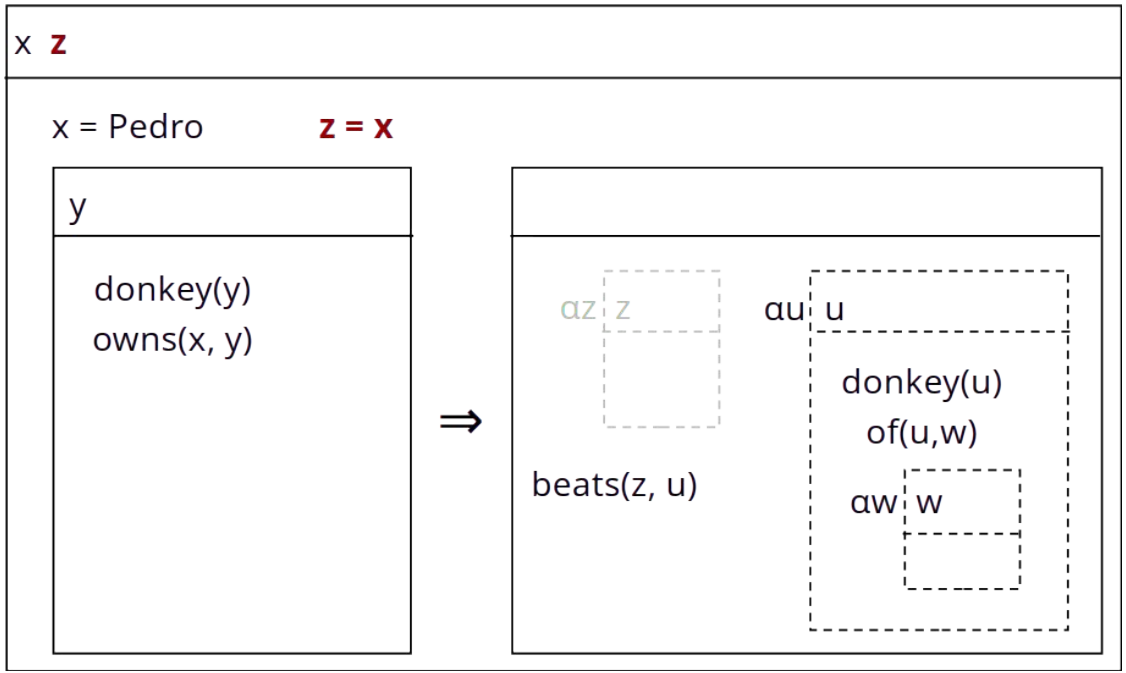

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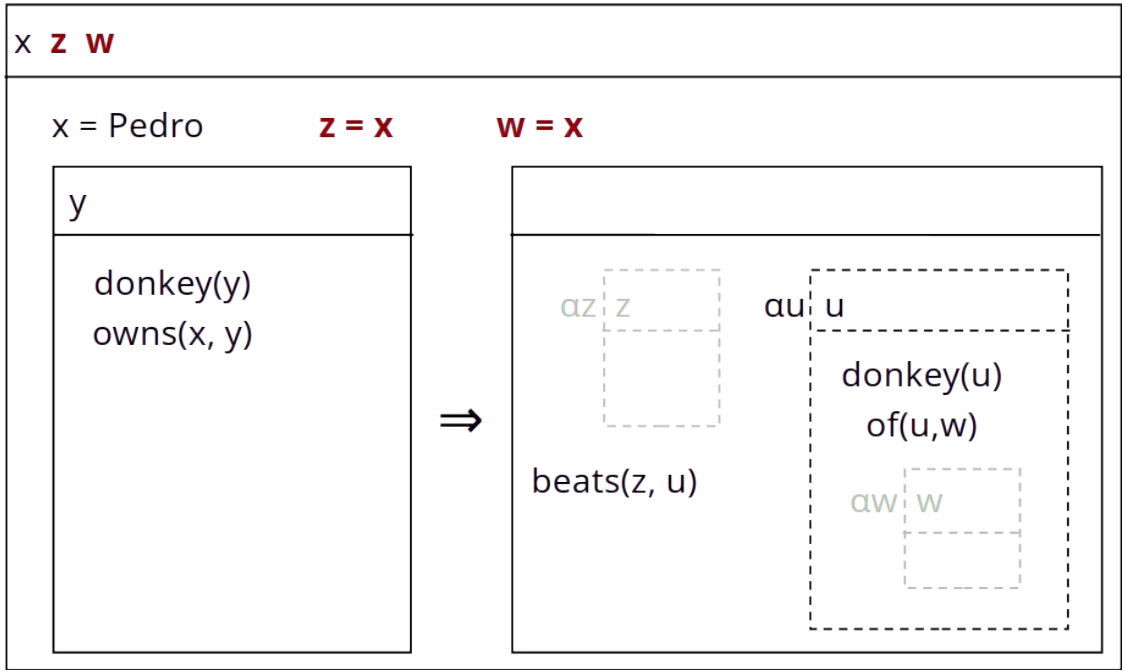

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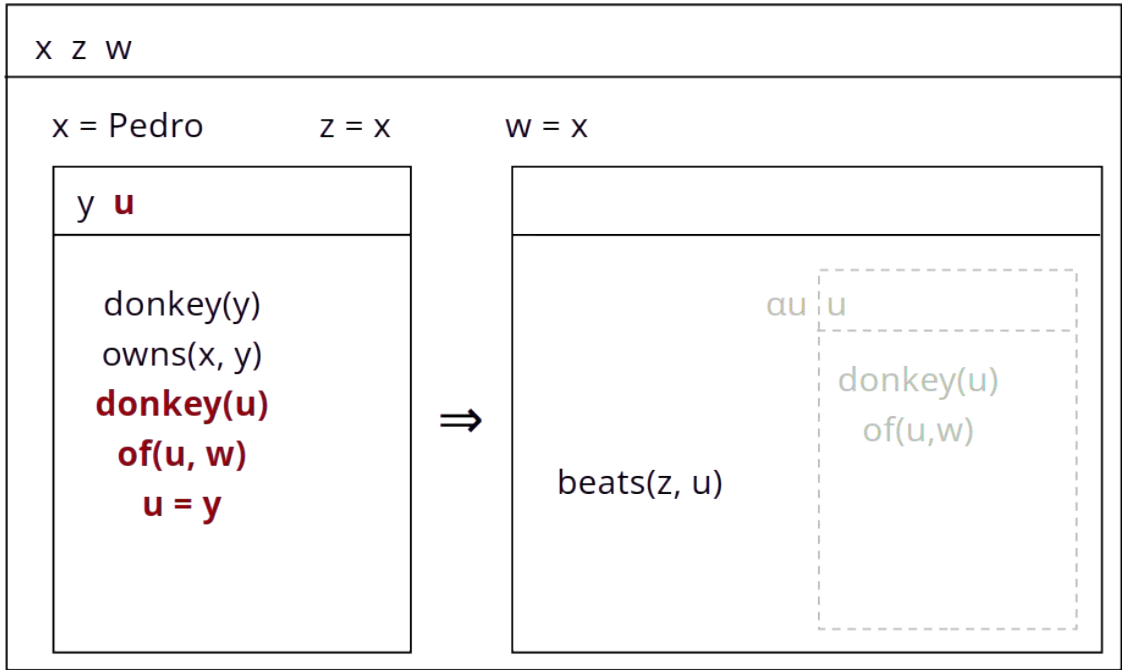

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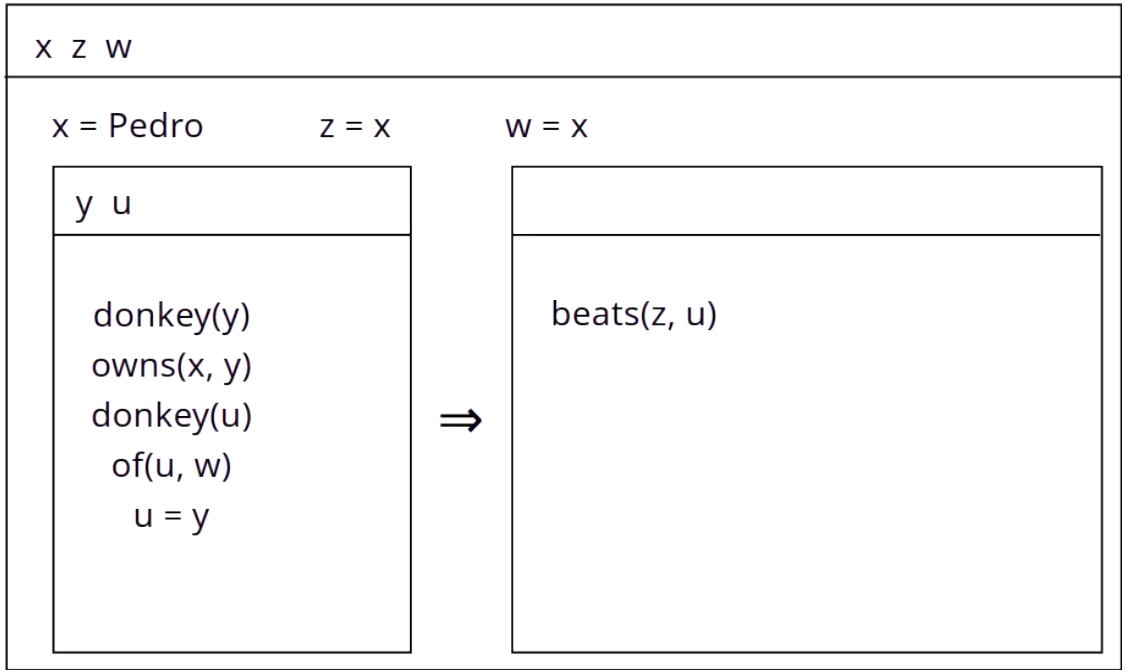


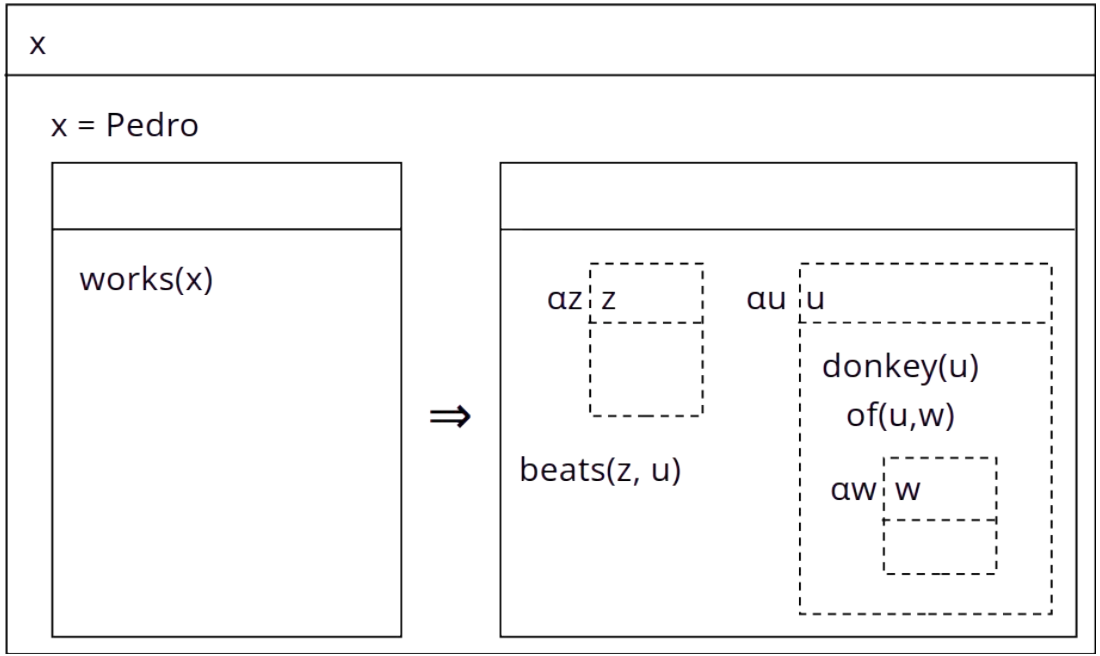
Presupposition resolution by accomodation

- Let K, K', K_t be some DRSs such that $K' \leq K$, $K_t \leq K$, and:
  - $\eta = \alpha x K_s \in A_K$, ($K_s$ is α-free)
  - K_t is a DRS that is accessible for η

- **Accomodation**:
  - $A_{K'} \leftarrow A_{K'} - \{\eta\}$
  - $U_{Kt} \leftarrow U_{Kt} \cup U_{Ks}$
  - $C_{Kt} \leftarrow C_{Kt} \cup C_{Ks}$

Resolution by accomodation: example

“if Pedro works, he beats his donkey”



Resolution by accomodation: example

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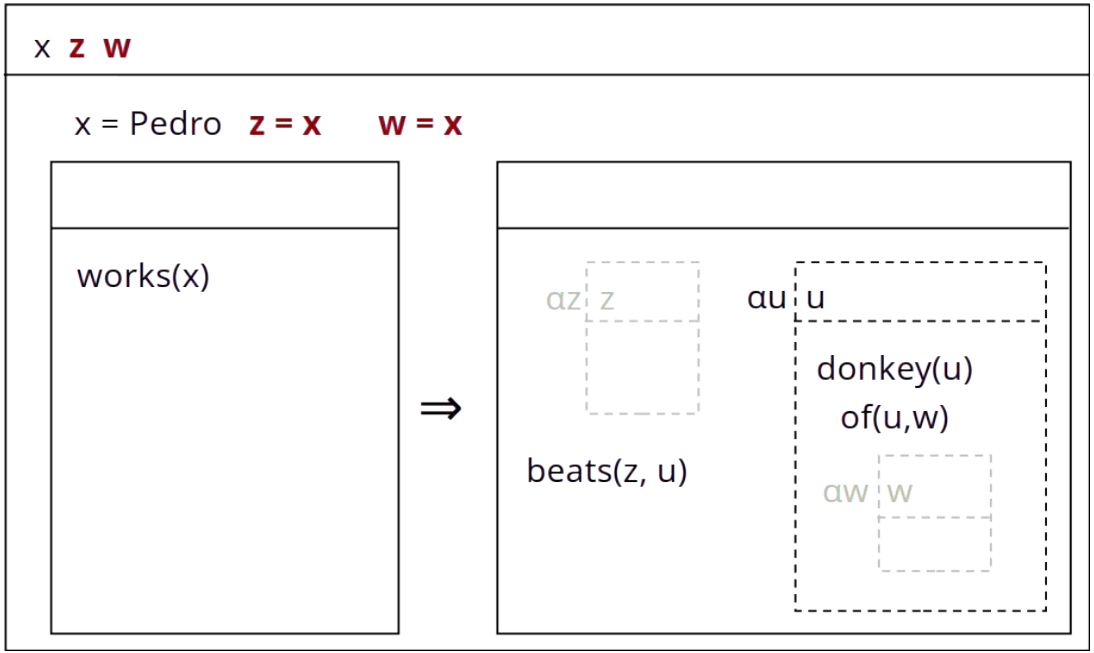

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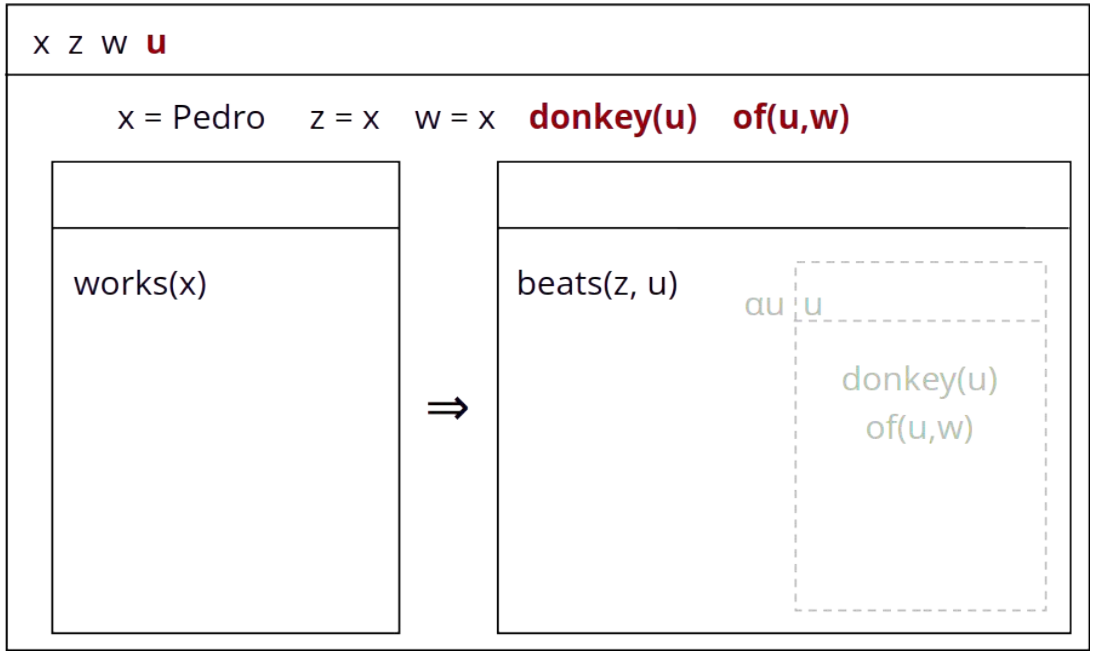


Presupposition resolution: preference principles

- Presupposition resolution in DRT is guided by the following principles:
    - Binding is preferred over accommodation
    - Binding works “upwards” along the accessibility relation: the closest possible antecedent is preferred
    - Accommodation works “downwards” along the accessibility relation: the highest possible DRS is preferred

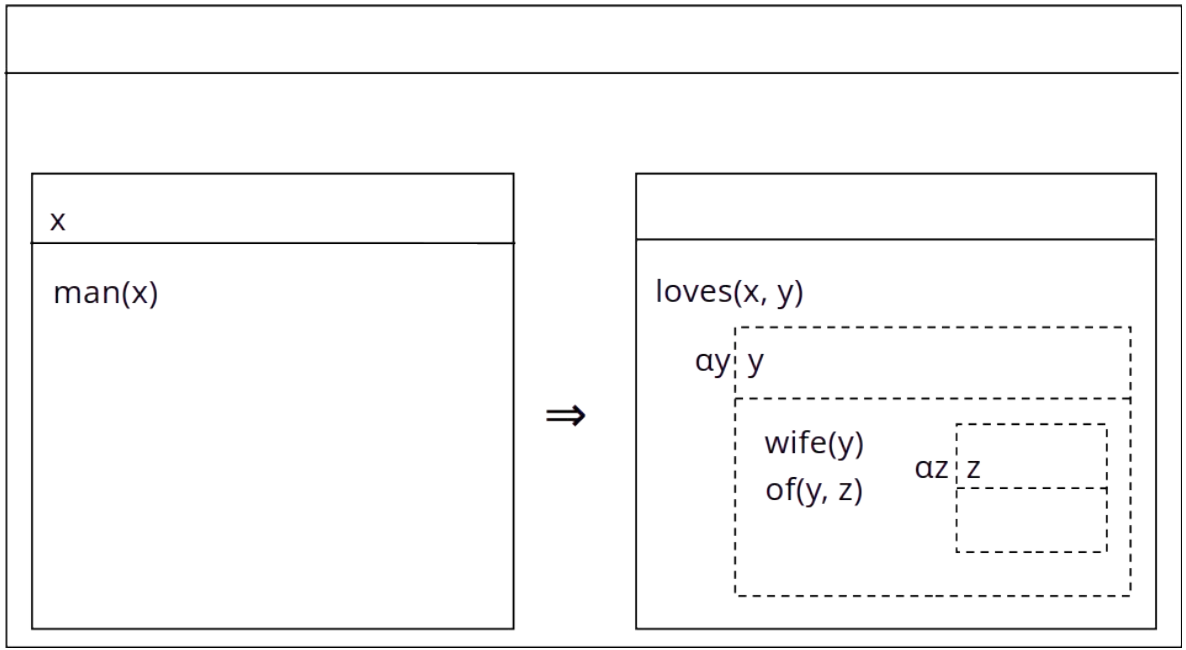
Constraints on projection

- **Free variable constraint**: a resolved DRS may not contain any free discourse referents

- **Consistency and informativity constraints**: the resolved DRS must be consistent and informative

Free variable constraint: example

“every man loves his wife”



Free variable constraint: example

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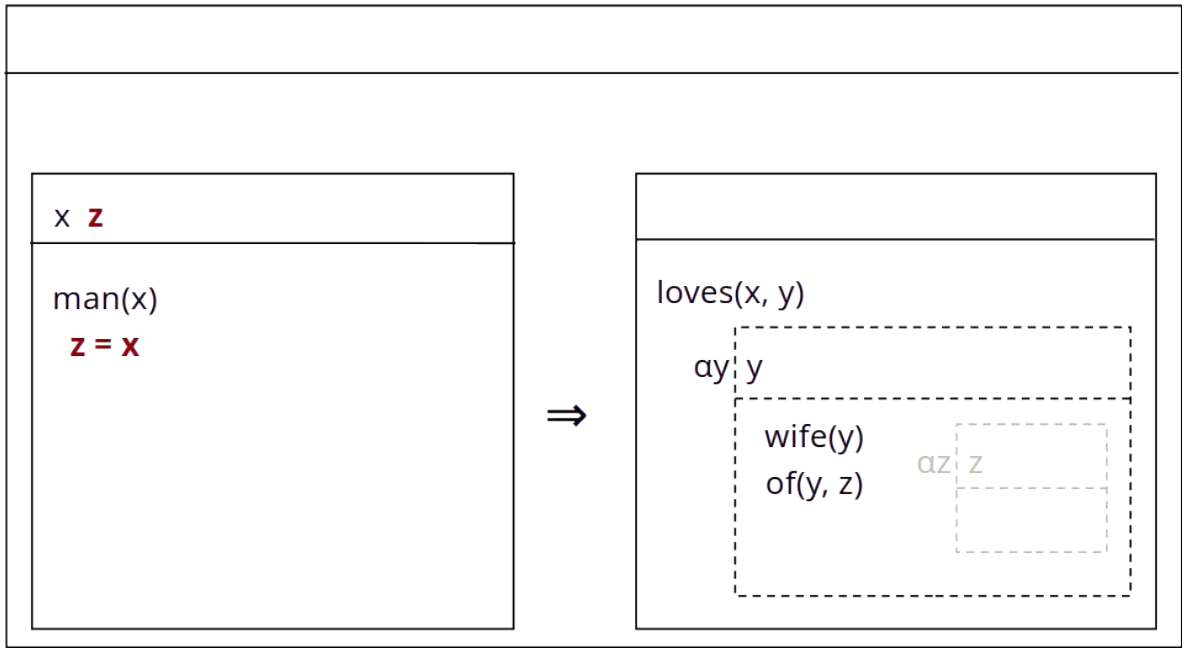

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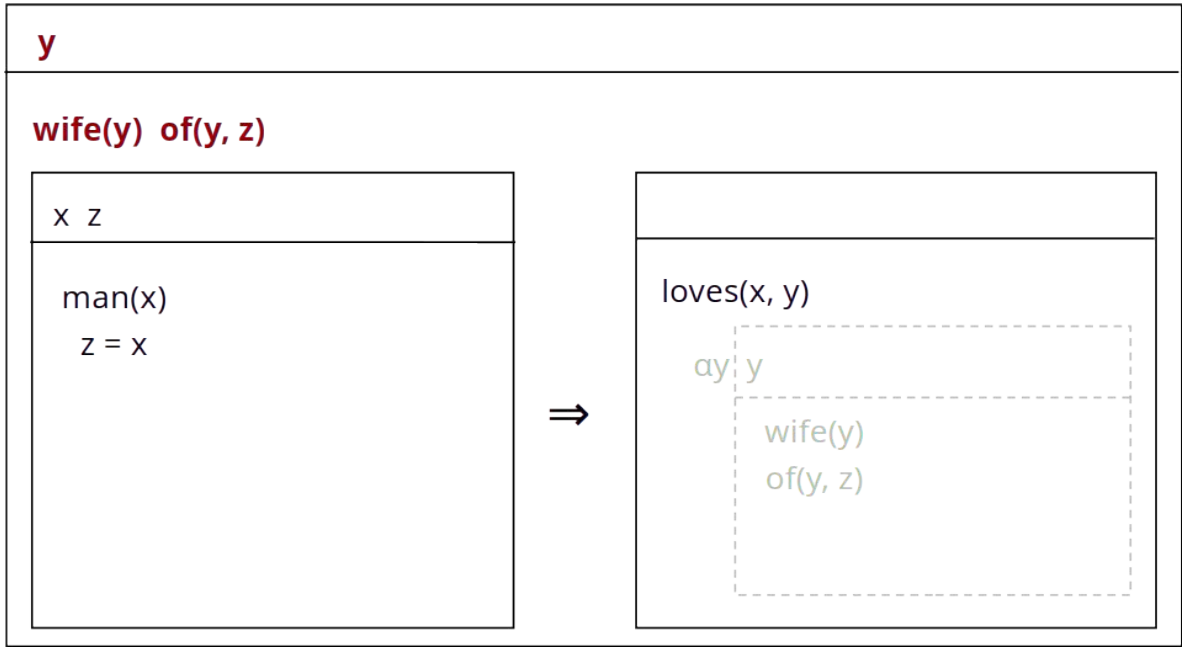
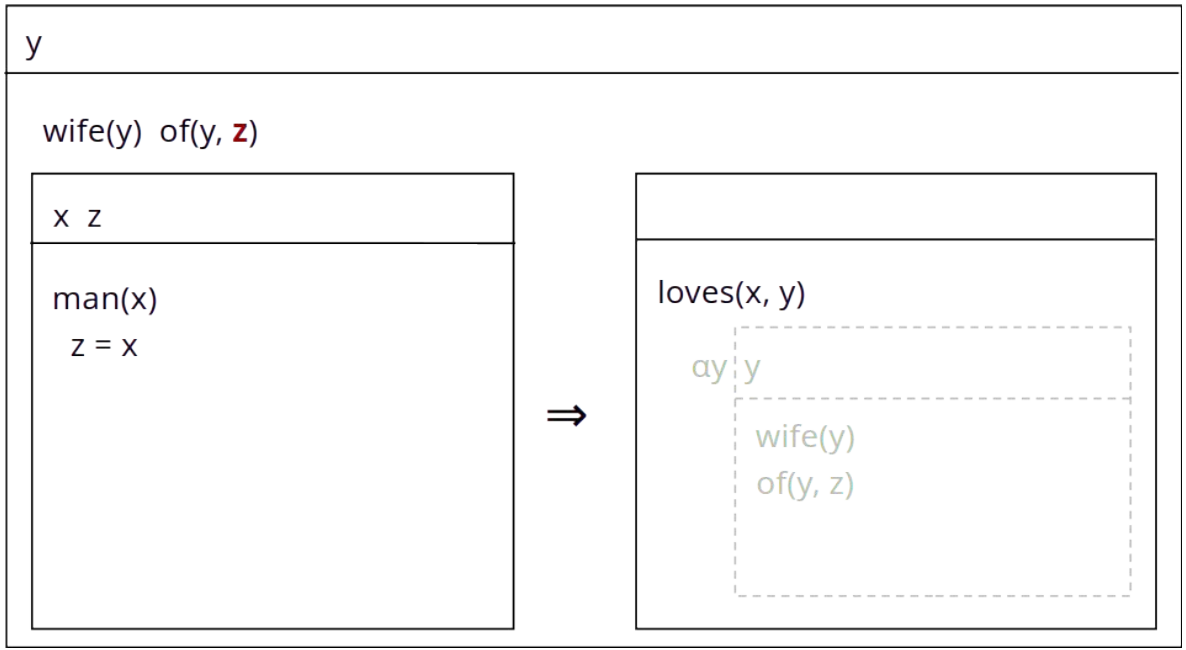


Free variable constraint: example

Invalid resolution:
discourse referent z is free

“every man loves his wife”



Free variable constraint: example

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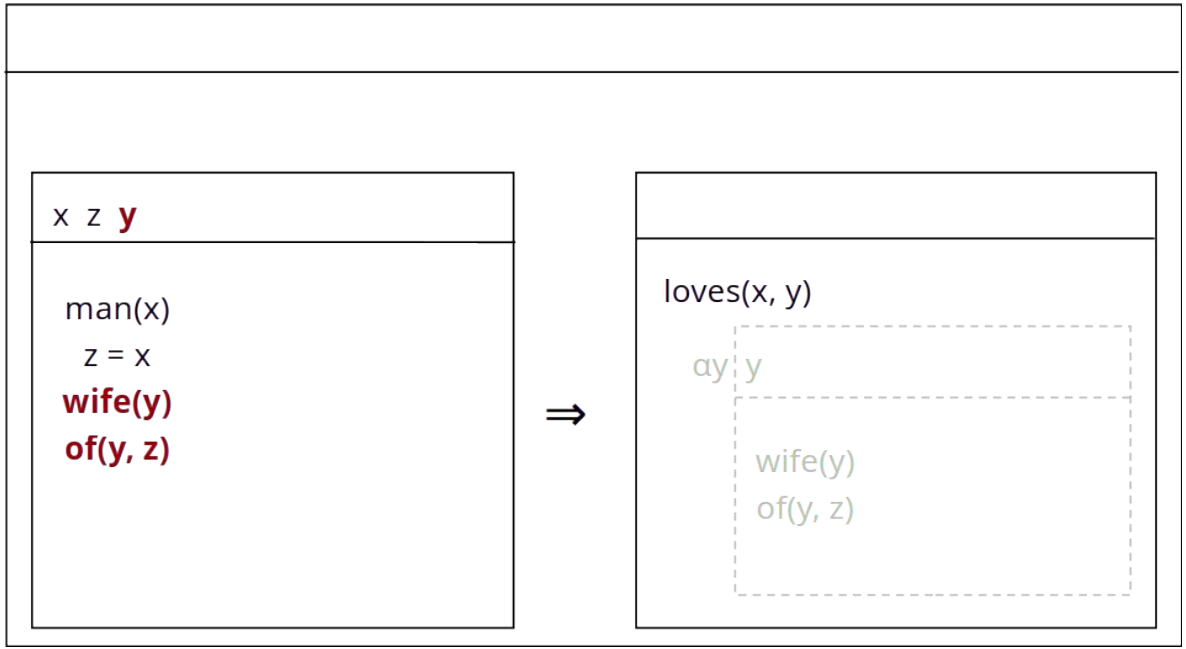


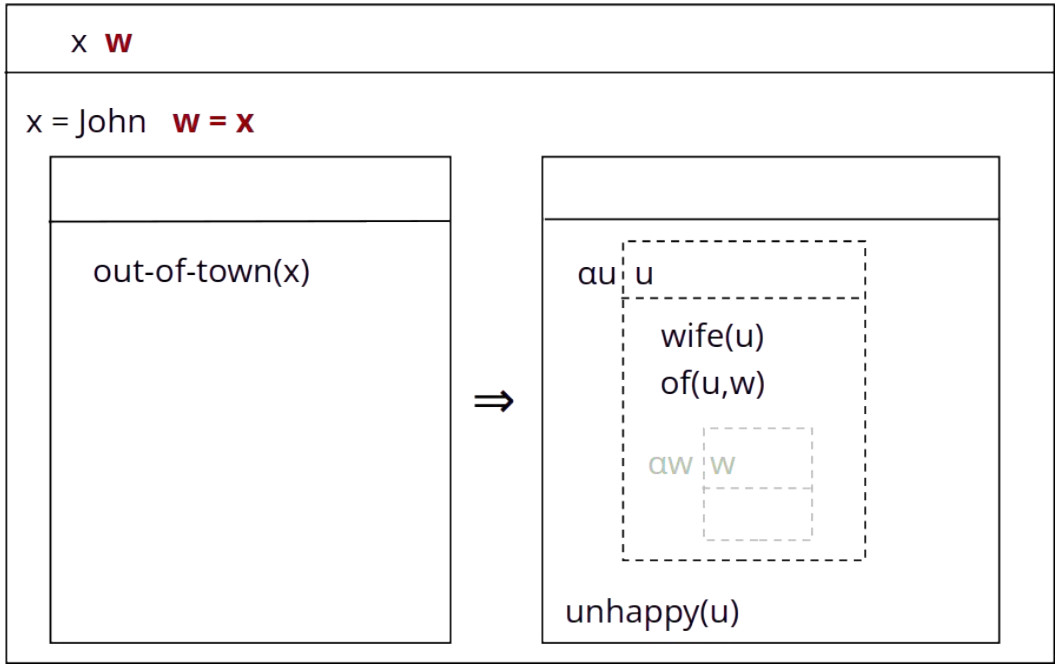
Consistency and Informativity constraints

- **Consistency**: the resolved DRS must be satisfiable (taking background knowledge into account)
  - **Local consistency**: no sub-DRS can be inconsistent with any superordinate DRS

- **Informativity**: the resolved DRS should *not* be entailed by our background knowledge
  - **Local informativity**: no sub-DRS can be entailed by any superordinate DRS

(Local) Informativity constraint: example

“if John is out of town, his wife is unhappy” ≫ “John has a wife”



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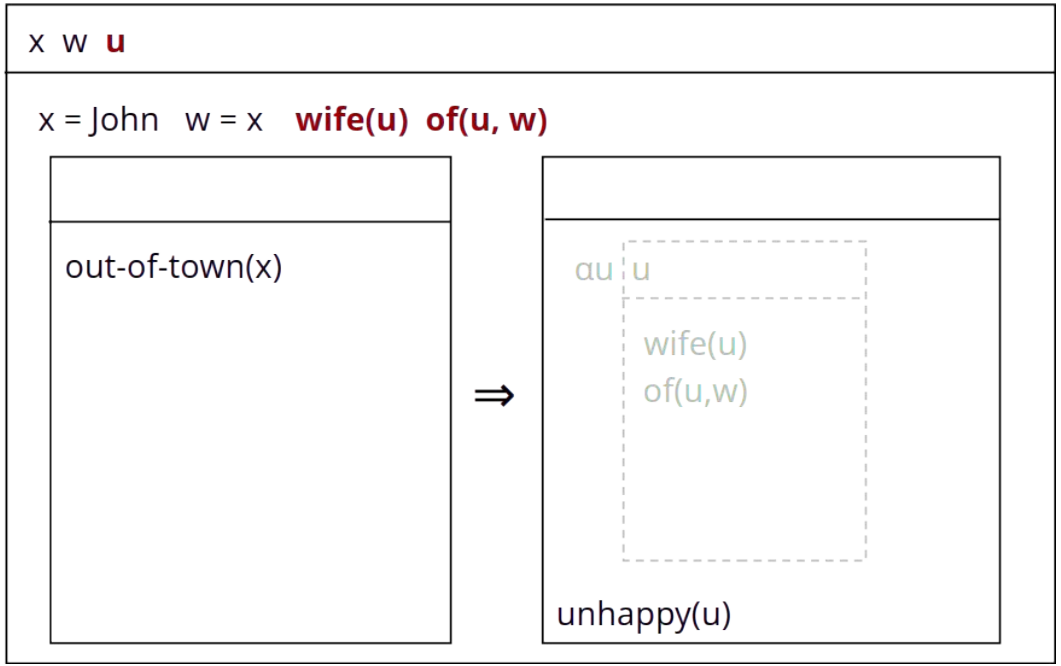
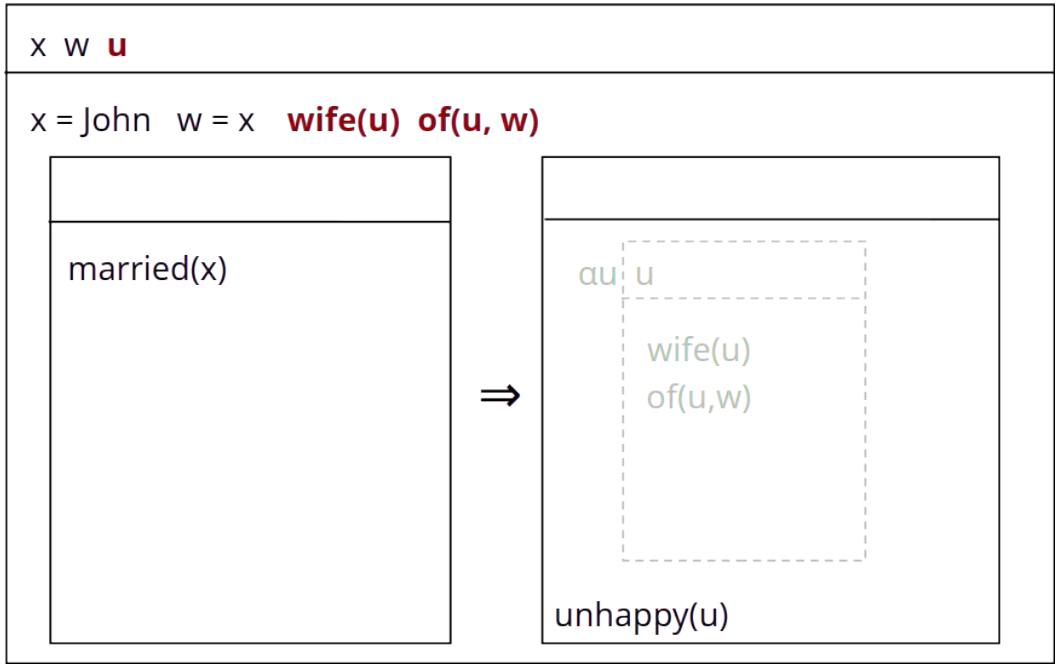


✅ The resolved DRS entails that John has a wife

(Local) Informativity constraint: example

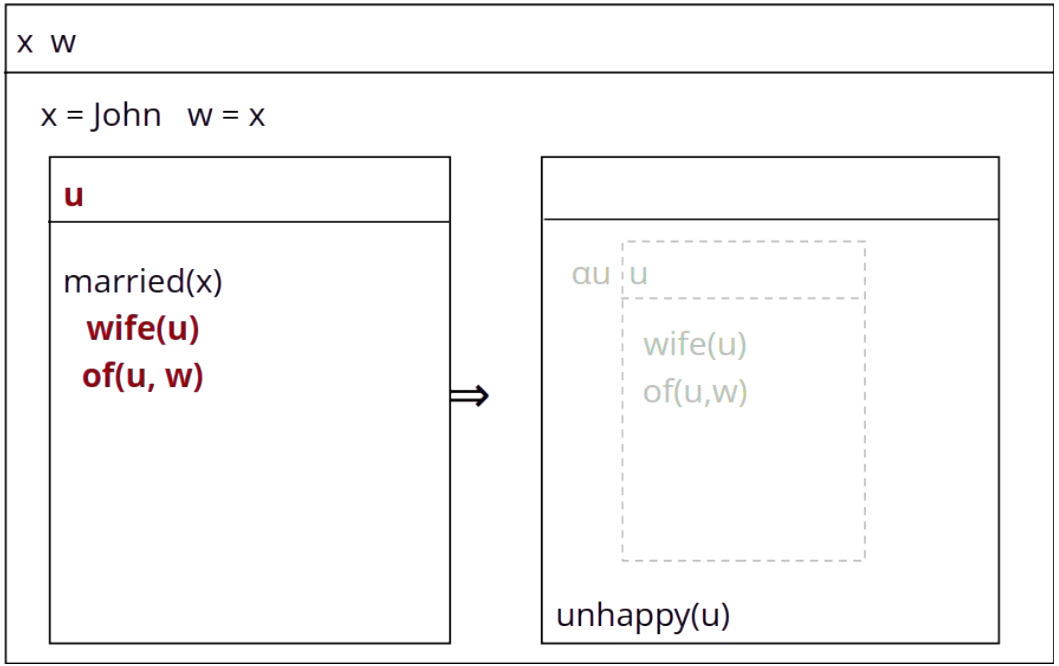
"if John is married, his wife is unhappy" ≫ ~~*"John has a wife"*~~



❌ **Inadmissible:** the top-level DRS entails the left-hand side of the conditional (⇒)

(Local) Informativity constraint: example

“if John is married, his wife is unhappy” ≫ ~~“John has a wife”~~



✅