Predicate-modifier asymmetries and the syntax-semantics interface

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Introduction

Two puzzles for a theory of adnominal modification and adjectival predication

This talk: syntax and semantics of attributive adjectives (modification) and predicative adjectives (predicates).

Two puzzles for an account of the semantics of adnominal modifiers:

1. How to account for the many semantic relationships that a modifier can have with the noun modified
2. How to account for asymmetries between attributive modification and adjectival predication

Puzzle 1: Many semantic relationships

Modifiers can predicate of different qualities of a noun, or otherwise perform different operations over some inherent event/temporal structure.

(1) a big city

   a. a city with a large area
   b. a city with a large population

(2) a red pen

   a. a pen with red ink
   b. a pen with a red barrel

(3) an old friend

   a. a friend who is old
   b. a friend who has been a friend for a long time

(4) the old president

   a. the aged president
   b. the former president

Puzzle 2: Asymmetries in attribution and predication

Often find that attribution and predication are asymmetric. Different readings for the same adjective in attributive versus predicative position.

(5) a. a beautiful dancer (individual or event reading)
b. This dancer is beautiful. (*event; individual-only)

(6) a. an old friend
(i) a friend who is old
(ii) a friend who has been a friend for a long time
b. My friend John is old.
(i) John is old.
(ii) *John has been a friend for a long time.

(7) a. a big idiot (degree or property)
b. That idiot is big. (*degree; property-only)

Big picture and roadmap

Big picture: How do we expose and correctly constrain lexical and contextual information in the course of the semantic derivation?

Claim for today: Semantics combines concepts, syntax tells what to combine plus adds constraints.

- Depart from usual assumption of semantic composition via argument saturation or intersection (e.g., the Heim & Kratzer (1998) view)
- Semantic composition via unification of semantic representations. Move to unification-based framework.
- Unification allows for composition in any way that is licit based on types within semantic representation.
- Syntax constrains unification via interpretable thematic role features.

Roadmap

1. Frame semantics as a representational framework for concepts
2. Interpretable thematic role features, and how to interpret them
3. Two case studies: color adjectives with readings driven by context, and event-related adjectives (*beautiful*)
4. Discussion, wrap-up

Syntax mediated composition

Evidence for this view

The proposal, restated: semantics puts together concepts in any semantically licit way, unless constrained by syntax.

The data from Puzzle 1 and Puzzle 2 contribute to the view that syntax only partially determines composition.

- Data from Puzzle 1 shows we need a flexible account for how A relates to N.

(8) red pen
  a. pen with red ink
  b. pen with red barrel

- Fine-grained lexical decomposition with a unification-based semantics can provide this flexibility.
- But, data from Puzzle 2 shows that syntax constrains this flexibility.

(9) a. beautiful dancer
  b. This dancer is beautiful. (*event reading)

- Syntax-semantic interface built around interpretable syntactic features can provide constraints.

Ingredients of the analysis

Semantic component:

- Lexical decomposition in essentially a neo-Davidsonian representation
- Adopt frame semantics as a representational format.
- Unification-based semantic framework.

Syntactic component:

- Minimalist syntax with Agree-based feature checking
- Finite set of (values for) thematic role features ([AGENT], [THEME], [HOLDER], ...). Interpretable thematic role features directly denote frames.
- Interpretable thematic role features on "argumental" DPs

The semantic representation: frame semantics

- Version of Düsseldorf frame semantics (Löbner 2014, 2017, Petersen 2007: a.o.).
- Theory of representations inspired by psychologist Barsalou's (1992) work on conceptual frames.
- A frame is a recursive attribute-value structure with functional attributes. Informally...
  - Types for values are properties (roughly speaking, $\langle e, t \rangle$)
  - Functional attributes (roughly speaking, type $\langle e, e \rangle$)
  - One value within a frame is distinguished as the "central node" or "referential node," which provides the type of the frame.
  - Values can have their own attributes, making frames recursive.
- Core idea: data structure describing an individual, with attributes and values that give additional semantic information about that individual. Rich lexical structure.

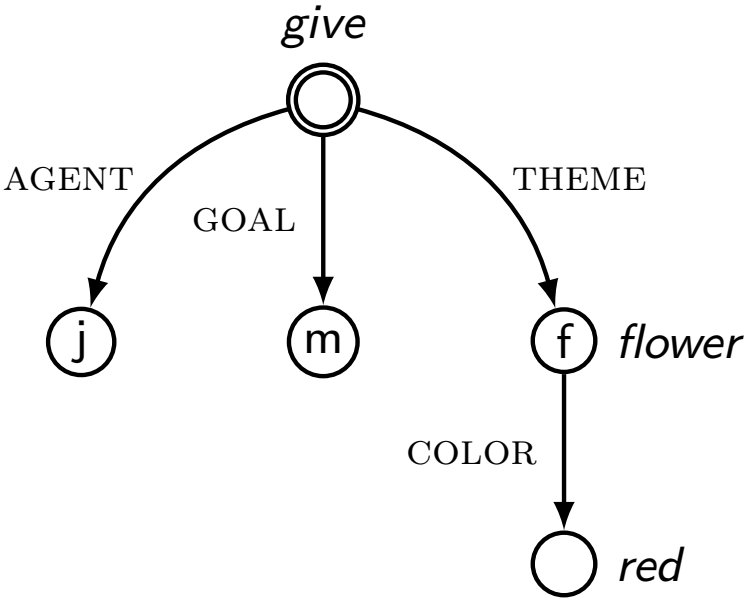
The semantic representation: frame semantics

- Representable in many ways (this talk: predicate logic, frame diagrams)
- Important: Composition of two frames via unification.
  - Identify sub-frames based on compatible types.
  - Possibly many ways of unifying two frames.
  - Two frames can unify if one frame subsumes the other, or if a third minimal frame subsumes them both.
  - Function Application and Predication Modification are special cases of unification.
  - See also grammatical frameworks like HPSG, and some varieties of DRT.

Frame example

(10) $[\![\textit{John gave the red flower to Mary}]\!] = \lambda e \begin{bmatrix} \textbf{give}(e) & \wedge \\ \textbf{j} = \textsc{agent}(e) & \wedge \\ \textbf{m} = \textsc{goal}(e) & \wedge \\ \textbf{f} = \textsc{theme}(e) & \wedge \\ \textbf{flower}(\textsc{theme}(e)) & \wedge \\ \textbf{red}(\textsc{color}(\textsc{theme}(e))) & \end{bmatrix}$

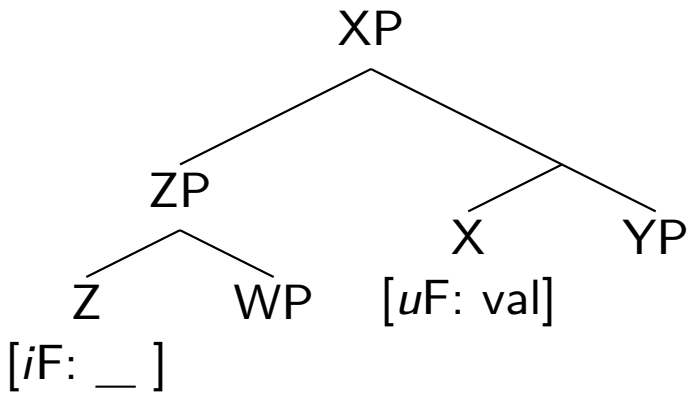
(11)



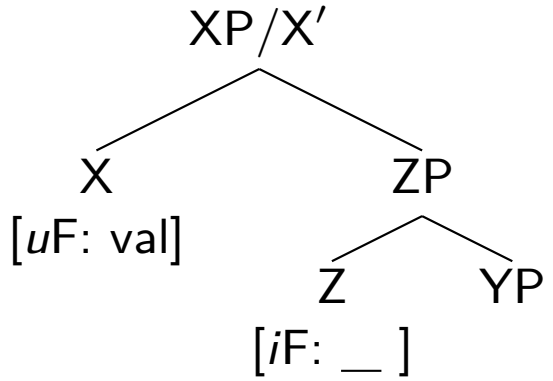
Syntax

- Agree-based feature checking system with uninterpretable and interpretable features (e.g., Adger (2003), Pesetsky & Torrego (2001)).
- Diacritic (*u* or *i*) specifies whether a feature is uninterpretable or interpretable.
- Interpretable features must be valued in the course of the syntactic derivation. Reflects status of being semantically interpretable.
- No semantic interpretation for uninterpretable features (deleted at LF).
- Assume agreement is possible under Head-Spec or Head-Comp configurations.

(12) Head-Spec Agreement



(13) Head-Comp Agreement



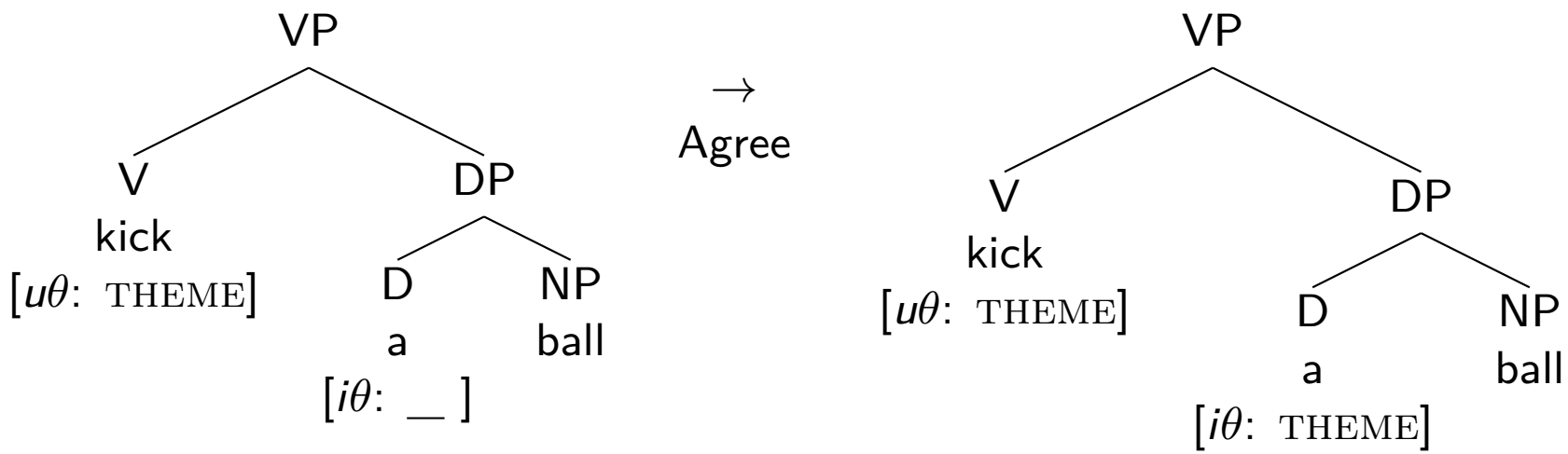
Thematic role features: syntax and semantics

- Thematic role features as an interface between syntax and semantics.[1]
- Finite set of values: AGENT, THEME, GOAL, HOLDER, and so on
- Interpretable thematic role features denote eventuality frames.

(14) a. $[\![[i\theta : \text{THEME}]]\!] = \lambda e[x = \text{THEME}(e) \wedge \textbf{event}(e) \wedge \textbf{entity}(x)]$

b. $[\![a\ ball\ _{[i\theta:\text{THEME}]}]\!] =$
$\lambda x[x = \text{THEME}(e) \wedge \textbf{event}(e) \wedge \textbf{entity}(x) \wedge \textbf{ball}(x) \wedge \ldots]$

(15)

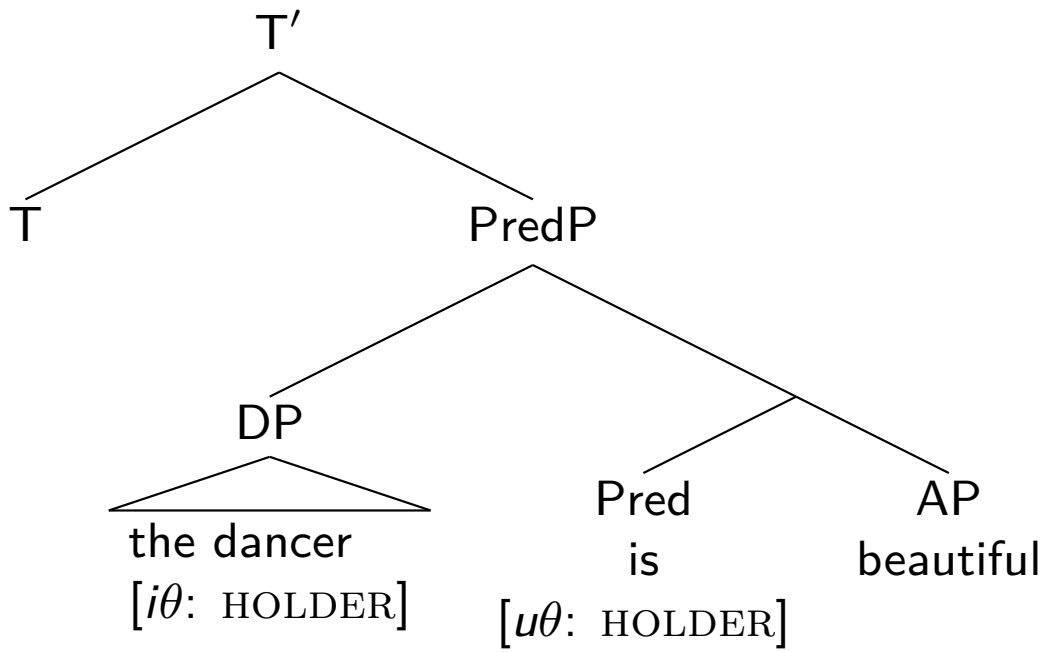


[1] See also Larson (2014), Hornstein (1999) for thematic role features.

Syntax of predication

- PredP syntax for predication (Bowers 1993, 2001, Baker 2003)
- Pred head hosts a [$u\theta$: HOLDER] feature.
- The subject DP's [$i\theta$: _] feature valued by HOLDER.
- Unification of AP frame and DP frame is constrained by the [$i\theta$: HOLDER] feature.

(16)



Predicative adjectives and [$i\theta$: HOLDER]

- Predicative adjectives are frames describing states.
  Not so dissimilar to how many verbs are frames describing events.
- Introduce $\approx$, which relates a state to a value of a frame attribute.[2]
- Referent of the DP is asserted to be the holder of the state via a syntactic feature [$i\theta$: HOLDER] valued in SpecPredP.

(17) $$[\![\ [i\theta\text{: HOLDER}]\ ]\!] = \lambda s \left[\begin{array}{c} x = \text{HOLDER}(s) \wedge z = \text{ATTR}(x) \wedge \\ \textbf{state}(s) \wedge s \approx z \end{array} \right]$$

- Example:

(18) $$[\![DP_{\ [i\theta:\text{HOLDER}]}\ [\ Pred\ AP\ ]\ ]\!] = \lambda s \left[\begin{array}{l} z = \text{ATTR}(x) \wedge \textbf{state}(s) \wedge \\ s \approx z \wedge x = \text{HOLDER}(s) \wedge \textbf{A}(z) \ldots \end{array} \right]$$

(19) $$[\![a\ pen_{\ [i\theta:\text{HOLDER}]}\ [\ Pred\ red\ ]\ ]\!] = \lambda s \left[\begin{array}{l} \textbf{pen}(x) \wedge z = \text{INK-COLOR}(x) \wedge \ldots \wedge \\ \textbf{state}(s) \wedge s \approx z \wedge x = \text{HOLDER}(s) \wedge \\ \textbf{red}(z) \wedge \ldots \end{array} \right]$$

[2] See the analysis of the predicational copula from Maienborn (2003, 2005, 2007).

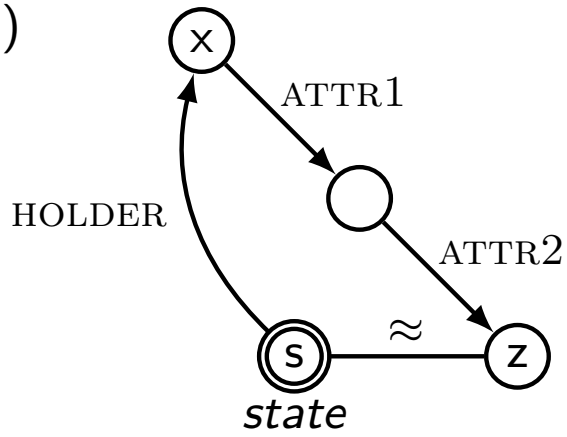
What is [$i\theta$: HOLDER] doing?

- Value that the state is related to must be an attribute of the HOLDER
- Must be either an attribute directly possessed by the HOLDER or an attribute that could be constructed from "chaining" attributes (e.g., function composition).

(20) a. $x = \text{HOLDER}(s) \wedge s \approx z \wedge z = \text{ATTR}(x)$
b. $x = \text{HOLDER}(s) \wedge s \approx z \wedge z = \text{ATTR}_2(\text{ATTR}_1(x))$

- Essentially, building a bi-directional between a value of an attribute and the possessor of that value, mediated by a state.

(21)



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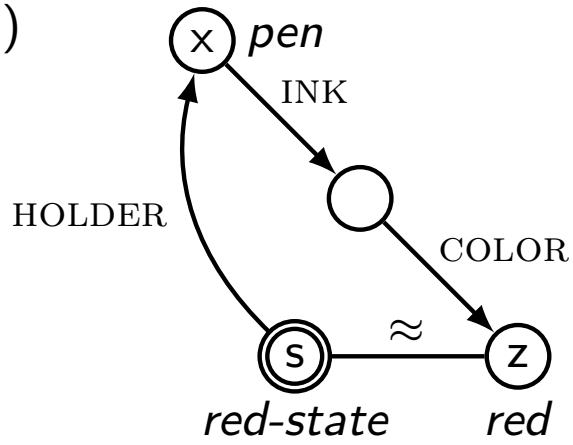

Case study 1: Conceptual and referential affordances with color adjectives

Conceptual and referential affordances

How do attributive adjectives modify nouns? Where do targeted attributes come from?

- NP provides the suitable attributes for the modifier *red* to target.

(23) a red pen

a. a pen with a red cap (attribute: CAP)
b. a pen that writes in red (attribute: INK)

- Context can also step in to offer more possibilities for how to link *red* with *box*.

(24) (*Context: For a fundraising sale, Adam and Barbara are sorting donated scarves according to color in different, identical, brown cardboard boxes. Barbara distractedly puts a red scarf in the box containing blue scarves.*)

Adam: Hey, this one belongs in the red box! (McNally & Boleda 2017)

Conceptual and referential affordances

Lose this contextually-driven composition in predicative adjectives.

- Minimally changed example in (25):

  (25) Adam: *Hey, this one belongs in the box that is red!

- Only properties of the nominal itself (e.g., color of the box) are able to drive composition with predicative adjectives.
- Asymmetry between attribution and predication with color adjectives such as *red*.
- What drives this asymmetry?

Analysis: attributive modification

- Attributive modification is a case of unmediated frame composition; absence of thematic role features.

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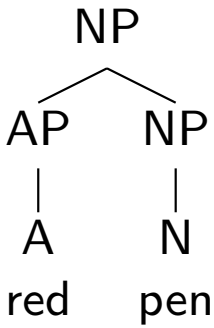


- Attributive adjectives may freely target attributes of the NP frame.
- AP and NP frames may combine in any way that is licit given the lexical content of their respective frames, context, and the speaker's world knowledge; no constraints on unification.

(27) $[\![\textit{red}]\!] = \lambda x[\textbf{red}(\textsc{color}(x))]$

(28) $[\![\textit{pen}]\!] = \lambda x[\textbf{pen}(x) \wedge c = \textsc{barrel}(x) \wedge i = \textsc{ink}(x) \wedge \ldots]$

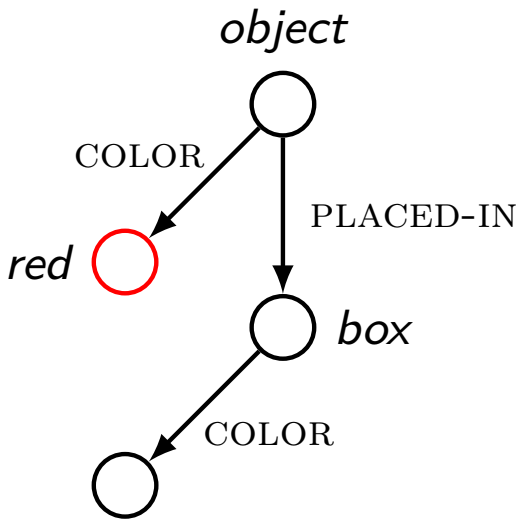
(29) a. $[\![\textit{red pen}]\!] = \lambda x[\textbf{pen}(x) \wedge \textbf{red}(\textsc{color}(\textsc{barrel}(x)))]$

b. $[\![\textit{red pen}]\!] = \lambda x[\textbf{pen}(x) \wedge \textbf{red}(\textsc{color}(\textsc{ink}(x)))]$

Additions from context: *red box*

- Rich view of context; context is a frame, and the NP frame includes context.
- Context frame can impose additional constraints on interpretation (i.e., background information regarding boxes as a location for objects of specific colors).
- Context is part of the semantic representation and not just as a free variable.

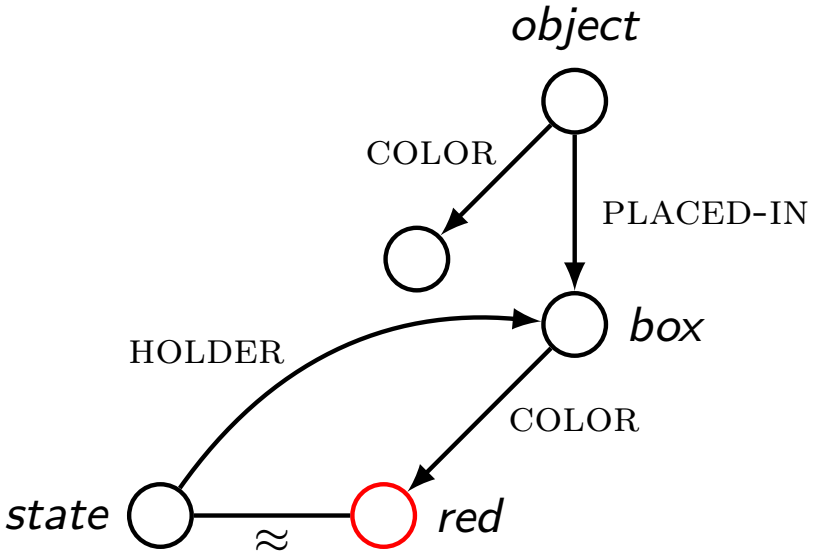
(30) *red box* (=box for red things)



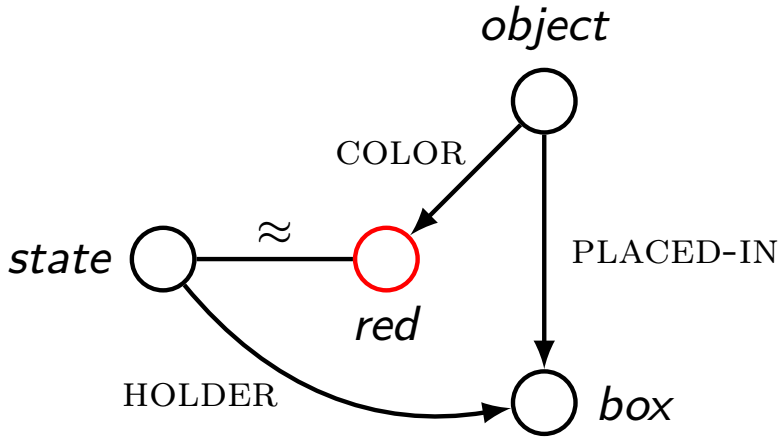
Analysis: Predicative adjectives

- More constrained representation for predicative adjectives.
- Recall: [$i\theta$: HOLDER] states that the HOLDER of the newly created state must also be the possessor of the value the state is created from.
- Bi-directional relationship set up by a [$i\theta$: HOLDER] feature rules out any unifications where the relevant attribute is not an attribute of the DP referent.

(31) *The box is red*
(= red colored)



(32) **The box is red*
(=place to put red objects)



Case study 2: event-related adjectives

Event-related adjectives

- Event-related adjectives such as *beautiful* also exhibit a predicate-modifier asymmetry.

  (33) Mary is a beautiful dancer.

  a. Mary is a dancer and she is beautiful. (intersective; referent-related)
  b. Mary is a dancer and she dances beautifully. (subsective; event-related)

  (34) This dancer is beautiful.
  $\nrightarrow$ This dancer dances beautifully. (event-related unavailable)

- Well-known observation from Larson (1998) and Vendler (1968).

Event-related adjectives in attributive position

- Event-related attributive modifiers target an attribute of an event within the semantic representation of the nominal.
- Two relevant attributes:
  - A MANNER attribute of events that maps an event to the manner of that event
  - A QUALITY attribute of individuals that maps an individual to a subjective quality.
- Adjective *beautiful* contributes a type specification for these attributes

(35) *beautiful dancer*

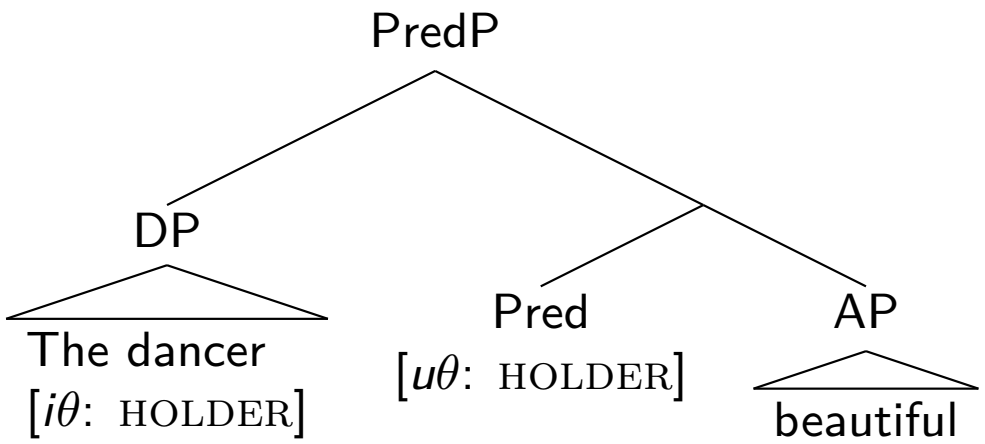
a. $[\![\textit{beautiful dancer}]\!] = \lambda x \left[\begin{array}{c} \textbf{person}(x) \wedge \textbf{dance}(e) \wedge \\ x = \textsc{agent}(e) \wedge \textbf{beautiful}(\textsc{manner}(e)) \end{array} \right]$

b. $[\![\textit{beautiful dancer}]\!] = \lambda x \left[\begin{array}{c} \textbf{person}(x) \wedge \textbf{dance}(e) \wedge \\ x = \textsc{agent}(e) \wedge \textbf{beautiful}(\textsc{quality}(x)) \end{array} \right]$

Event-related adjectives in predicative position

- In predicative position, a HOLDER thematic role links the referent of the subject DP to a state related to the adjective.

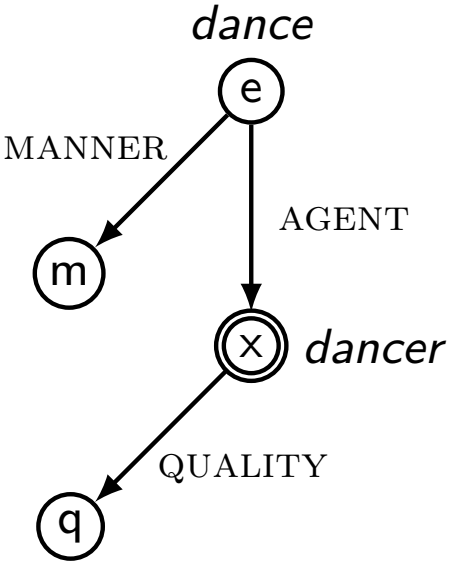
(36)



Event-related adjectives in predicative position

- [$i\theta$: HOLDER] will only allow for *beautiful* to specify the QUALITY attribute of the DP referent, and not the MANNER attribute of the event
- This is because MANNER attribute is not an attribute of the DP referent, inconsistent with the constraint contributed by [$i\theta$: HOLDER] .
- Thus, predicative adjectives cannot be interpreted as event-related (unless the subject DP itself denotes an event).

(37)



$$\lambda x \left[\begin{array}{c} \textbf{dance}(e) \wedge m = \text{MANNER}(e) \wedge \\ \textbf{dancer}(x) \wedge x = \text{AGENT}(e) \wedge q = \text{QUALITY}(x) \end{array} \right]$$

Discussion and Conclusion

Hasn't this been done before? Why not the traditional view?

Why not more traditional view(s)? Different perspectives on semantic type of adjectives:

- Uniform View 1: (At least some) adjectives are type $\langle e, t \rangle$:
  Need two rules of composition, both argument saturation (predication) and intersection (modification),[3] or a rule to raise adjective type in attributive position to $\langle et, et \rangle$.
- Uniform View 2: Adjectives are type $\langle et, et \rangle$:
  Need a rule to lower adjective type in predicative position to type $\langle e, t \rangle$.
- Ambiguity View: Adjectives are ambiguous in type:
  Duplication of content in the lexicon in many cases. Remove connection between attributive and predicative uses.

[3] This seems to be the preferred view currently, based on Heim & Kratzer (1998).

Hasn't this been done before? Why not the traditional view?

- Still need a lexical semantic theory: representations in (38) don't give insight into where modifier-predicate asymmetries come from, or how lexical content is accessed by modifiers.

(38) a. $[\![\textit{red pen}]\!] = \lambda x.\mathbf{pen}(x) \wedge \mathbf{red}(x)$
b. $[\![\textit{The pen is red}]\!] = \mathbf{red}(\iota x \in C.\ \mathbf{pen}(x))$

- Larsonian strategy of exposing certain lexical information in the argument structure implausible for many aspects of the lexical meaning.

(39) $[\![\textit{dancer}]\!] = \lambda e \lambda x[\mathbf{dance}(e) \wedge x = \textsc{agent}(e)]$

(40) $[\![\textit{pen}]\!] = \lambda i \lambda b \lambda i \lambda x[\mathbf{pen}(x) \wedge i = \textsc{ink}(x) \wedge b = \textsc{barrel}(x) \wedge i = \textsc{ink}(x)]$

Hasn't this been done before? Why not the traditional view?

This talk: Single semantic composition rule along with a decompositional lexical semantics, at the cost of increasing the complexity of the syntax.

Overall view: How are attribution and predication distinguished?

- Attribution and predication syntactically distinguished by presence/lack of thematic role marking.
- Attribution contributes a type specification to a value.
- Adjectival predication adds an additional meaning postulate building (what is essentially) a bi-directional relation between individual and attribute value.
- Attribution is unconstrained; type specification can in principle be added anywhere within a frame.
- This is consistent with the hypothesis that unification is the sole means of semantic composition, but is constrained by syntax in certain cases.

Conclusion

- Examined two questions:
  - How to expose lexical information in a compositional way
  - How to constrain lexical information to derive modifier-predicate asymmetries
- New way of thinking about this problem via the use of frame semantics and thematic role features.
- Interpretable thematic role features as a way of constraining frame representations.
- Modification as unconstrained frame unification, but predication as constrained unification.
- **View of the grammar:** Syntax tracks the order of concept (frame) composition plus imposes constraints, while semantics does the heavy lifting in combining concepts (frames)
- **Not pictured:** This is the beginning of a general program for modeling syntax-semantics interface using frame semantics that adapts off-the-shelf syntactic machinery. No previous attempts made (to my knowledge) of using frame semantics with Minimalist syntax.

Acknowledgements

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