Linguistics 575: Semantic Representations

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Overview

- Course goals
- Course requirements
- Course expectations
- DELPH-IN context
- ERG demo
- What is meaning?
- What is semantics?

But first…

- https://www.ehs.washington.edu/fsoemerprep/evacinfo.shtm

Course goals

- Understand the relationship between NL semantics and ‘meaning’
- Understand the MRS formalism
- Understand what information is captured in the MRS formalism
- ... by comparing to other representations of meaning
- ... and getting a more fine-grained idea of what the mismatches are
- Explore how those mismatches are or are not motivated by the contrast between compositional semantics and other approaches to meaning

Course requirements

- http://faculty.washington.edu/ebender/2013_575/

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Precision Grammars

- Encode linguistic analyses
- Map surface(-y) strings to semantic representations
- Model grammaticality
- Are more consistent and more scaleable than treebank-trained grammars
- Take sustained effort to develop

Why precision grammars

- Linguistic research
- Scalability/domain portability
- Applications which require rich, precise semantic information
    - NLU
- Applications which require grammatical realizations
    - Grammar checking, anything requiring generation

Normalizing dependencies

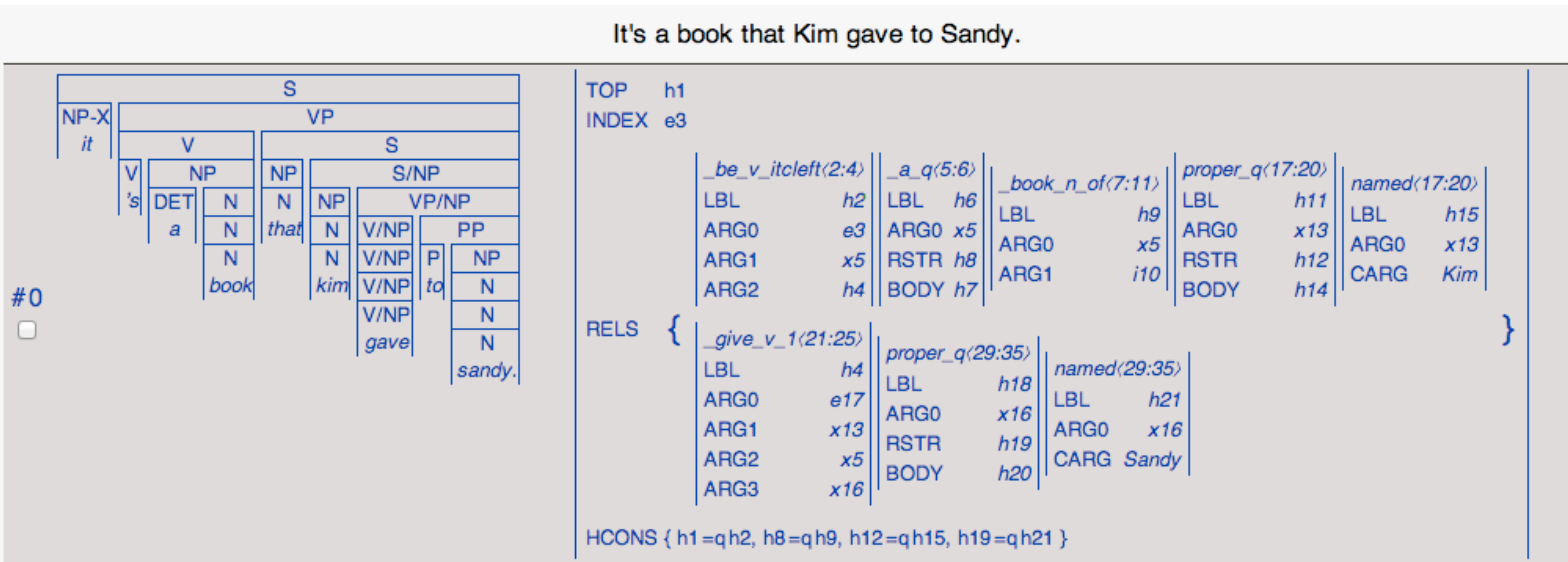
- Kim gave Sandy a book.
- Kim gave a book to Sandy.
- A book was given to Sandy by Kim.
- This is the book that Kim gave to Sandy.
- I’m looking for the book given to Sandy by Kim.
- Kim gave Sandy and Pat lent Chris a book.
- Which book do you think that Kim gave to Sandy?
- It’s a book that Kim gave to Sandy.
- This book is difficult to imagine that Kim could give to Sandy.

Better linguistics

- What computer scientists must imagine syntacticians do
  - We say we study rule systems assigning structure to natural language, and mapping between surface forms and semantic representations
  - The rule systems are formal and the modeling domain is complex
- If we make our analyses machine readable:
  - computers can verify that the systems work as intended
  - and validate against far more data

(cf. Bender 2008)

Example from the English Resource Grammar (Flickinger 2000, 2011)



erg.delph-in.net

ERG complexity (Flickinger 2011)

- As of 2010, the English Resource grammar comprised:
  - 980 lexical types
  - 35,000 manually constructed lexeme entries
  - 70 derivational and inflectional rules
  - 200 syntactic rules
- All of these pieces interact, sometimes in surprising ways
- 20+ person-years of development effort

The DELPH-IN ecology www.delph-in.net

- Head-drive Phrase Structure Grammar (Pollard & Sag 1994)
- Joint reference formalism (Copestake 2002a)
- Shared semantic representation formalism (MRS; Copestake et al 2005)
- Grammars: ERG (Flickinger 2000, 2011), Jacy (Siegel & Bender 2002), NorSource (Hellan & Haugereid 2003), ...
- Grammar generator: Grammar Matrix (Bender et al 2002, 2010)
- Parser generators: LKB (Copestake 2002b), PET (Callmeier 2002), agree, ACE

The DELPH-IN ecology www.delph-in.net

- Parse and realization ranking: (e.g., Toutanova et al 2005, Velldal 2008)
- Robustness measures: (e.g., Zhang & Kordoni 2006, Zhang & Krieger 2011)
- Regression testing: [incr tsdb()] (Oepen 2001)
- Applications: e.g., MT (Oepen et al 2007), QA from structured knowledge sources (Frank et al 2007), Textual entailment (Bergmair 2008), ontology construction (Nichols et al 2006) and grammar checking (Suppes et al 2012)

Multilingual grammar engineering: Other approaches

- The DELPH-IN consortium specializes in large HPSG grammars
- Other broad-coverage precision grammars have been built by/in/with
        - LFG (ParGram: Butt et al 2002)
    - F/XTAG (Doran et al 1994)
    - HPSG: ALE/Controll (Götz & Meurers 1997)
    - SFG (Bateman 1997)
- Proprietary formalisms and Microsoft and Boeing and IBM

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Meanings of ‘mean’

- A user types in: *cherry blossom viewing locations*
  - Search engine (engineer) wants to know what the user **means** by that
  - The user wants the search engine to know what she **means** by that
- Wikipedia says “Hanami (花見?, lit. "flower viewing") is the Japanese traditional custom of enjoying the beauty of flowers, "flower" in this case almost always meaningcherry blossoms ("sakura") or (less often) plum blossoms ("ume").” and an IE system (engineer) wants to know what that **means**.
- お花見している人が大勢だった **means** “There were a lot people viewing the cherry blossoms.”
- “You post too many photos of cherry blossoms.” “What do you **mean** by that?”
- The semanticist wants to know why *Kim believes that cherry blossoms are beautiful* and *Kim believes that cherry blossoms are beautiful and 1+1 = 2* don’t **mean** the same thing.

Meaning (Speaks 2010)

- Semantic theories v. theories of meaning
- Propositional v. non-propositional semantic theories
- Mentalist v. non-mentalist theories of meaning

Compositionality (Szabó 2012)

- Compositionality of meaning v. compositionality of reference
- Local v. global compositionality
- Collective v. distributive compositionality
- Cross-linguistic v. language-bound compositionality
- Compositionality of standing meaning v. compositionality of occasion meaning

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