Natural Language Processing
CMSC 723 (spring, 2001)

April 25 - May 2, 2001

- Chapter 16: Lexical-Semantics
- Meaning of Words
- Lexical Relations
- WordNet
- Thematic Roles

Meaning of Words

Lexical-semantics: What it is?

Definitions

- What is the **lexicon**?
- What is a **lexeme**?
- What is a (word) **sense**?
- What is a **dictionary**?
- What is a **computational lexicon**?

Lexical Relations I: Homonomy

What is **homonomy**?

- A **bank** holds investments in a custodial account
- Agriculture is burgeoning on the east **bank**

Variants:

- homophones - "read" and "red"
- homographs - "bass" and "bass"

Lexical Relations II: Polysemy

What is **polysemy**?

- The **bank** is constructed from red brick
- I withdrew the money from the **bank**

Word Sense Disambiguation

For any given lexeme, how can its senses be reliably distinguished?

Lexical Relations III: Metaphor and Metonymy

- What is **metaphor**?
  That doesn't **scare** Digital.
- What is **metonymy**?
  GM **killed** the Fiero.

Extension of existing senses to a new meaning.

Lexical Relations IV: Synonomy

What is **synonomy**? Substitutability.

- How **big** is that plane?
- How **large** is that plane?

Compare:

- A **big** fat apple
- ?A **large** fat apple

Influences on substitutability:

1. subtle shades of meaning differences
2. polysemy
3. register
4. collocational constraints

Lexical Relations V: Hyponomy (Ontology, Taxonomy)

What is **hyponomy**?

General: **hyponym**

Specific: **hypernym**

- Example: “car” is a **hyponym** of “vehicle” and “vehicle” is a **hypernym** of “car.”
- Test: “That is a car” implies “That is a vehicle”

What is **ontology**?

What is **taxonomy**?

What is **object hierarchy**?

WordNet

[Figure 16.1]

WordNet is the most widely used hierarchically organized lexical database for English — Fellbaum (1998).

Format of WordNet Entries

[Figure 16.2]

WordNet sense entries consist of a set of synonyms, a dictionary-style definition (or gloss), and some example uses.

Distribution of Senses among WordNet Verbs

[Figure 16.3]

Lexical Relations in WordNet

[Figure 16.4]

[Figure 16.5]

[Figure 16.6]

Synsets in WordNet

WordNet is organized around the notion of **synset**.

{chump, fish, fool, gull, mark, patsy, fall guy, sucker, schlemiel, shlemiel, soft touch, mug}

Important: It is this exact synset that makes up one of the sense for each of the entries listed in the synset.

Theoretically, each synset can be viewed as a **concept** in a taxonomy—like the concepts described in Chapter 14.

Hyponomy in WordNet

[Figure 16.7]

Internal Structure of Words

What are the meaning components underlying word senses?

Thematic Roles (θ-roles)

What is a **thematic role**?

- $\exists w, x, y, z$ Giving(x) $\wedge$ Giver(w,x) $\wedge$ Givee(z,x) $\wedge$ Given(y,x)

- $\exists w, x, z$ Breaking(x) $\wedge$ Breaker(w,x) $\wedge$ BrokenThing(z,x)

Generic Thematic Roles

[Figure 16.8]

Examples of Thematic Roles

[Figure 16.9]

Early Theories of Thematic Roles

1967–1968: "The beginning of Lexical Semantics" Fillmore; Gruber; Jackendoff (based on Gruber).

Two fundamentally different approaches to linguistics:

- **Gruber/Jackendoff**: Account for semantics and use grammar derived to say something about syntax

- **Fillmore**: Account for syntax and use that to describe semantics

Comparison of θ-Role Paradigms

Role	Description	F	G/J	Example
Theme (Patient)	entity undergoing effect of some action	D, F, O	Theme	Mary fell over
Agent (Actor)	instigator of some action	A	Agent	John killed Harry
Experiencer	entity experiencing some psych state	D	?Theme	John was happy
Benefactive	entity benefiting from some action	B	Goal	John bought some flowers for Mary
Instrument	means by which something comes about	I	?Theme	John wounded Harry with a knife
Locative	place where event is situated or takes place	L	Location	John hid the letter under the bed
Goal	entity towards which something moves	–	Goal	John passed the book to Mary
Source	entity from which something moves	–	Source	John returned from Paris
Temporal	time of action	T	Time	The meeting was at 9:00

D=dative(affectum),F=factive(effectum),O=objective(neutral)