Today's Topics

• Some possible test cases for WordNet
Example: using bfs2.perl

- Word:
  - cadge
  - brook
  - cacophony

- Definition:
  - mooch
  - tolerate
  - discordant sound
Using WordNet: Example

- **Semantic Opposition:**
  
  1. John mended the *torn* dress  
     John mended the *red* dress

  *Event-based Models of Change and Persistence in Language* (Pustejovsky, 2000)

- **Semantic Bleaching:**
  
  2. #Kim *boxed* the present in a *paper bag*  
     ... to *land* a hydroplane on *water*

  *Remarks on Denominals* (Kiparsky, 1997)

- **Logical Metonymy:**
  
  3. Mary enjoyed the *sonata* (listen to/play)  
     #Mary enjoyed the *door* (?? telic role)

  *Generative Lexicon* (Pustejovsky, 1995)
Using WordNet: Example

**Persistence and Change of State Verbs**

*Event-based Models of Change and Persistence in Language* (Pustejovsky, 2000):

<table>
<thead>
<tr>
<th>John mended the <strong>torn</strong> dress</th>
<th>John mended the <strong>red</strong> dress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mary cleaned the <strong>dirty</strong> table</td>
<td>Change of State</td>
</tr>
<tr>
<td>The waiter filled every <strong>empty</strong> glass</td>
<td></td>
</tr>
<tr>
<td>Mary fixed the <strong>flat</strong> tire</td>
<td></td>
</tr>
<tr>
<td>Bill swept the <strong>dirty</strong> floor</td>
<td>Activity</td>
</tr>
<tr>
<td>Bill swept the <strong>dirty</strong> floor clean</td>
<td>Accomplishment</td>
</tr>
<tr>
<td>Nero built the <strong>gleaming</strong> temple</td>
<td>Creation</td>
</tr>
<tr>
<td>Nero ruined the <strong>splendid</strong> temple</td>
<td>Destruction</td>
</tr>
</tbody>
</table>
Using WordNet: Example

Event Template Representation

Change of State Verbs:

John mended the *torn/red* dress

\[ mend: x \text{ CAUS } y \text{ BECOME } <\text{STATE (mended)}> \]

John CAUS the *torn/red* dress BECOME <STATE (mended)>

- Antonym relation between adjective and end state
Using WordNet: Example

- Find shortest link with antonym relation in derivation chain:

- mend $\rightarrow$ tear: reachable in 6 ways.
## Using WordNet: Example

### Results

<table>
<thead>
<tr>
<th>Candidate Pair</th>
<th>Shortest Chain</th>
<th>Semantic Opposition</th>
<th>Search Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>mend-torn</td>
<td>5</td>
<td>Yes</td>
<td>1261</td>
</tr>
<tr>
<td>mend-red</td>
<td>-</td>
<td>No</td>
<td>11974</td>
</tr>
<tr>
<td>fix-leaky</td>
<td>5</td>
<td>Yes</td>
<td>12167</td>
</tr>
<tr>
<td>fix-blue</td>
<td>11</td>
<td>No</td>
<td>14553</td>
</tr>
<tr>
<td>fix-flat</td>
<td>-</td>
<td>No*</td>
<td>12286</td>
</tr>
<tr>
<td>mix-powdered</td>
<td>6</td>
<td>Yes</td>
<td>11931</td>
</tr>
<tr>
<td>comfort-crying</td>
<td>9</td>
<td>Yes</td>
<td>11359</td>
</tr>
<tr>
<td>blue-white</td>
<td>-</td>
<td>No*</td>
<td>24431</td>
</tr>
<tr>
<td>rescue-drowning</td>
<td>13</td>
<td>Yes</td>
<td>9142</td>
</tr>
<tr>
<td>clean-dirty</td>
<td>1</td>
<td>Yes</td>
<td>61</td>
</tr>
<tr>
<td>fill-empty</td>
<td>1</td>
<td>Yes</td>
<td>48</td>
</tr>
</tbody>
</table>
Using WordNet: Example

1. Thresholding

No upper limit on the length of the shortest chain.

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Using WordNet: Example

2. Shortest Path Criterion

Take the shortest chain.

<table>
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Diagram: Graphical representation of the shortest path criterion involving words related to "flat" and "fix".
Using WordNet: Example

3. Color and Opposition

**WORDNET organizes color by chromaticity.**

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</table>

John painted the *red* door *blue*

Mary painted the white tiles grey
Semantic Bleaching

Three Problems

• Semantic Opposition:

1. John mended the *torn* dress
   John mended the *red* dress

   *Event-based Models of Change and Persistence in Language* (Pustejovsky, 2000)

• Semantic Bleaching:

2. #Kim boxed the present in a *paper bag*
   ... to land a hydroplane on *water*

   *Remarks on Denominals* (Kiparsky, 1997)

• Logical Metonymy:

3. Mary enjoyed the *sonata* (listen to/play)
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   *Generative Lexicon* (Pustejovsky, 1995)
Semantic Bleaching

Denominal Verbs: Box and Butter

Remarks on Denominals (Kiparsky, 1997):

John boxed the present
John PUT present IN <box> Location
John boxed the present in a gift box
#John boxed the present in a paper bag

John buttered the bread
John PUT <butter> ON bread Locatum
John buttered the bread with margarine
#John buttered the bread with marmalade/onions
Semantic Bleaching

Partial Bleaching

Peter *shelved* the books on the *windowsill/mantelpiece/stand/table*

#Peter *shelved* the books on the *ball/spike/ceiling/floor/balcony*

Sue *breaded* the fish with *breadcrumbs/shredded coconut/crushed almonds*

#Sue *breaded* the fish with *marmalade/butter/treacle/ice*
Semantic Bleaching

Full Bleaching

Location verbs:

to land a hydroplane on water
to dump garbage by the roadside
to ditch a car in a vacant lot
to warehouse the empty crates in the silo

Locatum verbs:

highways blanketed with fog
burgers blanketed with onions
streets blanketed with cars
a steep embankment blanketed with dense foliage
Semantic Bleaching

Full Bleaching

Locatum verb (blanket):

- highways blanketed with fog
- burgers blanketed with onions
- streets blanketed with cars
- a steep embankment blanketed with dense foliage

Locatum verb (blindfold):

- blindfolded with his own shirt/duct tape/a filthy rag/a teacosy

- Note: blindfold, dump are de-verbals (diachronically)...)
Semantic Bleaching

**Question**

Can WordNet be used to predict and account for semantic bleaching?

Spectrum of bleaching:

- box
- butter
- shelf
- bread
- blanket
- blindfold
- none
- partial
- full
Semantic Bleaching

**Using WORDNET**

- Concept of *shelf* as a horizontal support:

- Web search *(shelved +on <location>):
  - windowsill  mantle  case  radiator  table  stand  carrel
  - bookstand  bookshelf
Semantic Bleaching

Support and Shelf

<noun.artifact> shelf
- (a support that consists of a horizontal surface for holding objects)
  => <noun.artifact> support
- (any device that bears the weight of another thing)
Semantic Bleaching

Table and Shelf

Cannot account for *table*:

- Notion of “functional” hyponymy
Semantic Bleaching

Hyponyms of Support

andiron, firedog, dog, dogiron, arch support, back, backrest, backboard, baluster, base, pedestal, stand, bearing, bearing wall, bedpost, bookend, brace, bracket, bridge, foot, foothold, footing, handrest, hanger, harness, harp, headstock, leg, perch, pier, pillow block, rack, stand, rest, rib, rocker, seat, shelf, skeg, sling, spoke, radius, step, stair, stirrup, stirrup iron, stock, gunstock, structural member, tailstock, tee, football tee, undercarriage, yoke
Semantic Bleaching

**WordNet and Non-Bleaching Verbs**

Asphalt and tarmac:

-the crew asphalted/tarmaced the road with fresh asphalt/new tarmac

#the crew asphalted/tarmaced the road with concrete

#the crew asphalted/tarmaced the road with cobblestones
Semantic Bleaching

**Paving Materials**

Hypothesis: Denominal leaf nodes are non-bleaching
Semantic Bleaching

Bleaching and Leaf Concepts

- **Counterexamples:** *blanket* and *blindfold*

  highways *blanketed* with fog
  burgers *blanketed* with onions
  streets *blanketed* with cars
  a steep embankment *blanketed* with dense foliage
Semantic Bleaching

Blanket

Functional superordinate: covering

\[
\text{blanket}_1 \xrightarrow{\text{isa}} \text{bedclothes} \xrightarrow{\text{isa}} \text{cloth covering} \xrightarrow{\text{isa}} \text{covering}_1 \xrightarrow{\text{isa}} \text{artifact} \\
\text{entity} \xrightarrow{\text{isa}} \text{object} \\
\text{natural object}
\]

\[
\text{blanket}_2 \xrightarrow{\text{isa}} \text{covering}_2 \xrightarrow{\text{isa}} \text{artifact} \\
\text{entity} \xrightarrow{\text{isa}} \text{object} \xrightarrow{\text{isa}} \text{natural object}
\]
Semantic Bleaching

Bleaching of Blanket

Web Data:

snow, fog, parachutes, sauce, smog, debris, ash, flowers, glaze, wildflowers, bacon, forest, garland, mixed grill, turkey, ham, smoke, compost, clippings, mulch, cheese, onions, plants, fallout, panels, bodies, pines, mixture, foliage, tephra, blast material, craters, salsa, yogurt, shards, paper, scrub, cars, till, wilderness, loess, crabmeat, fondue, logos, landmines, deposits, Teflon, bags, turf, notices, bracken, heather, moss, mud, fronds, trees, groves, posters, handbills, doorknobs, powder, haze, sand, absorbent, leaves, stars, crickets, peanuts, plaques, foul air, particles, ice, rainforest, spruce, cedar, coating
Semantic Bleaching

Bleaching of Blanket

Exclude metaphorical uses:

The countryside is blanketed in snow, but it is also blanketed with concern [BBC NEWS]

Event semantics:

x PUT <blanket> ON/OVER y
x PUT <covering> ON/OVER y

Same goes for blindfold...
Semantic Bleaching

**Spindle and Spear**

the dragon has been spindled on a spear
x PUT y on <spindle>

WordNet hierarchy:
Semantic Bleaching

Components of a Spear

WordNet hierarchy:

- Two senses for *spear*:
  1. an implement with a *shaft* and a barbed point used for catching fish
  2. a long pointed *rod* used as weapon
- Notion of Indirect Functionality: *sharpened shaft* or *rod*
Logical Metonymy

Three Problems

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Logical Metonomy

**Eventive Verbs: Begin and Enjoy**


John **began** the novel *(reading/writing)*

The author **began** the unfinished novel back in

1962 *(writing)*

**novel:**

- telic role: *read* *(purpose/function)*
- agentive role: *writing* *(creation)*

**event/non-eventive noun mismatch:** coercion
Logical Metonomy

Eventive Verbs: Begin and Enjoy


- John **began** the novel *(reading/writing)*
- The author **began** the unfinished novel back in 1962 *(writing)*
- Mary enjoyed the novel *(reading)*
- !!The visitor enjoyed the door *(telic role)*
- Mary enjoyed the garden *(seeing...)*
Logical Metonymy

Multiple Telic Roles

Mary enjoyed the garden (seeing)
Mary enjoyed inspecting the garden
Mary enjoyed visiting the garden
Mary enjoyed strolling through the garden
Mary enjoyed rollerblading in the garden
Mary enjoyed sitting in the garden
Mary enjoyed dozing in the garden
Logical Metonomy

**Discourse and Telic Roles**

Easily defeasible:

<table>
<thead>
<tr>
<th>My goat eats anything.</th>
<th>He really enjoyed your book</th>
</tr>
</thead>
<tbody>
<tr>
<td>My dog eats everything.</td>
<td>He really enjoyed your shoe</td>
</tr>
</tbody>
</table>

(reading)  
(eating)  
(Lascarides & Copestake, 1995)

Logical Metonomy

WordNet and Telic Roles

John enjoyed the cigarette  (smoking)
Logical Metonymy

Contextual Function Search Rules

Principle of Specificity: Prefer $R_i$ to $R_j$ in

Override possible but requires strong contextual support

Principle of Locality: Plausibility of $R_i$ scales with $m$
and inversely with $l$
Logical Metonomy

Polysemy

!John enjoyed the dirt

- dirt
  - earth
  - body waste
  - gossip
  - material
  - substance
  - physical object
- report
- speech act
- act

heard
read
Logical Metonomy

**Type/Function Distinction**

Mary enjoyed the wine  (drinking)
Logical Metonomy

Type/Function Distinction

Mary enjoyed the amphetamine (abuse)
Logical Metonomy

Grammatical Constraint

!!John enjoyed the door
EXP enjoy NP
EXP; enjoy [PRO; [V(ing) NP]]

- door
  - movable barrier
  - entrance
- barrier
  - obstruction
  - access
  - way
- artifact
  - create
  - verbs of perception
- physical object

x block y

x enter y

define enter
Logical Metonomy

Grammatical Constraint

!He enjoyed your shoe  [PRO [V(ing) shoe]]
Logical Metonymy

Summary

- Linguistic phenomena as benchtests for WordNet relations
  
  *Antonymy:* Semantic Opposition
  *Hypernymy:* Semantic Bleaching and Logical Metonymy

- Linguistic phenomena help point out problems and possible refinements
  
  Semantic Opposition: representation of color
  Bleaching: distinguish functional/non-functional hypernymy
  Logical Metonymy: telic role annotation

- Other issues
  
  Language specificity? Variation in N→V conversion