Topics in Computational Linguistics — Grammar Engineering —

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http://lingo.stanford.edu/courses/05/ge/
Semantics of words and phrases

- **Logical form**
  - Most semantic content is supplied by the lexicon
    - one relation per lexeme
  - Most syntactic rules simply append the \texttt{RELS} of their daughters
  - Some rules supply additional content
Construction-specific semantics

- Motivation: Some part of the semantics of a phrase cannot be drawn from any of its daughters
- Approach: Allow the rule admitting that phrase to introduce directly one or more semantic relations
- Mechanism: Introduce an additional attribute on phrase called C–SEM (construction or rule semantics)
The C-SEM attribute on phrases
Example 1: Noun-noun compounds

The dog fence collapsed

```
S
 / \
/   \   
NP   VP
 /     \
/       
/         
/           
/             
Det   N   V
|       |     |
|       |     |
|       |     |
|       |     |
|       |     |
the  N  N  collapsed
    |     |
    |     |
    |     |
    |     |
dog  fence
```
MRS for noun-noun compounds

The dog fence collapsed

\[\text{collapse}(e1, (n-n-\text{cmpnd}(\text{dog}(x), \text{fence}(y))))\]

[ INDEX 0
  RELS <!
  [ PRED ‘‘the\_q\_rel’’
    ARG0 2 ]
  [ PRED ‘‘dog\_n\_rel’’
    ARG0 1 ]
  [ PRED ‘‘fence\_n\_rel’’
    ARG0 2 ]
  [ PRED ‘‘n-n-\text{cmpnd}\_rel’’
    ARG1 1
    ARG2 2 ]
  [ PRED ‘‘\text{collapse}\_v\_rel’’
    ARG0 0
    ARG1 2 ] !> ]
Example 1: Noun-noun compounds
Example 2: Bare plural noun phrases

The dogs chased cats

```
S
 / \ /
NP VP
 / / /
Det N V NP (Bare-plural-rule)
 / / / /
the dogs chased N
   / |
   cats
```
The dogs chased cats
\( (\text{chased}((\text{the}(x) \ \text{dog}(x)), ((\text{generic}_{q}(y) \ \text{cat}(y)))))) \)

[ INDEX 0
RELS <!
 [ PRED ‘‘the_q_rel’’
ARG0 1 ]
[ PRED ‘‘dog_n_rel’’
ARG0 1 ]
[ PRED ‘‘chase_v_rel’’
ARG0 0
ARG1 1
ARG2 2 ]
[ PRED ‘‘generic_q_rel’’
ARG0 2 ]
[ PRED ‘‘cat_n_rel’’
ARG0 2 ] !> ]
Bare plural rule

```
<table>
<thead>
<tr>
<th>SEM</th>
<th>semantics</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD-DTR.SEM</td>
<td>semantics</td>
</tr>
<tr>
<td>C-SEM</td>
<td>phrase</td>
</tr>
</tbody>
</table>

semantics

INDEX 1
RELS 2 + 3
```

```
<table>
<thead>
<tr>
<th>HD-DTR.SEM</th>
<th>semantics</th>
</tr>
</thead>
</table>

INDEX 1
RELS 2

<table>
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<th>C-SEM</th>
<th>semantics</th>
<th>generic_q_rel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ARG1 1</td>
</tr>
</tbody>
</table>
```
Example 3: Lexical rule for causative verbs

The gate opened.
That cat opened the gate.

```
         S
          / \  \
          /   \  \
         NP   VP
          / \  / \  / \  / \  \
         Det N V NP
          / \  \
         that cat V Det N
          / \  \
         opened the gate
```
MRS for derived causatives

That cat opened the gate
\((cause(e1, cat(x), (open(e2, gate(y))))))\)

\[
[ \text{INDEX 0} \\
\text{RELS} <! [ \text{PRED `that_q_rel`} [\text{ARG0 1 }],
\text{PRED `cause_v_rel`} [\text{ARG0 0}, \text{ARG1 1}, \text{ARG2 2 }],
\text{PRED `the_q_rel`} [\text{ARG0 3 }],
\text{PRED `cat_n_rel`} [\text{ARG0 1 }],
\text{PRED `open_v_rel`} [\text{ARG0 2}, \text{ARG1 3 }],
\text{PRED `gate_n_rel`} [\text{ARG0 3 }] ] !> ]
\]