

## Homework 6

### Due Tuesday, 04/08/08

Please turn in a print-out of your homework solutions at the beginning of class. If a program is required for a problem then you should provide sample input and output. (If the input is data from an on-line source then you may just indicate where the file can be found.) Programming solutions to problems should be placed in separate files whose names indicate the problem number (e.g. prob1.py). These separate files should be put into a folder whose name includes the assignment number and your name (e.g., Hmwk1-yourname). This folder should be dragged into the class dropoff folder at `/common/cs/cs181/dropbox`.

1. In class we provided the semantics of intransitive and transitive verbs. Please provide the semantics for ditransitive verbs like “threw”, as in “John threw Mary a ball”. You may assume that there is a binary relation *threw* (and any other ditransitive verbs in the language) among the non-logical symbols.

Be careful, as the direct and indirect objects are both NP’s and hence their semantics have type  $VPT_{\text{type}} \rightarrow D$  – neither is just an element of the model.

Illustrate how your semantics works by carefully evaluating (by hand) “John threw Mary a ball” by building up the meaning from the meaning of each of the words in the sentence.

2. The file `sem2.fcfcg` takes a simple English grammar and adds features to compute the semantics. (See section 12.7 of Bird for an explanation and further discussion of grammar files like this.) The idea is that the `sem` feature for each non-terminal symbol *X* contains a lambda expression. When the lambda expression for the sentence symbol *S* is evaluated, it will return the meaning of the sentence.

Please extend the grammar so that it can interpret all of the following sentences:

```

a woman votes
Hillary Clinton runs
if Hillary runs then Bill cheers
Clinton or Obama wins
every citizen votes
a republican votes
Romney or a woman wins
every democrat or republican votes
if Obama beats Clinton then Obama wins
McCain or Paul wins Washington
every delegate selects Clinton
Obama convinces every democrat or republican
Clinton wins or quits
every candidate wins or loses
Romney endorses a candidate or wins
McCain endorses a candidate or picks Paul
Obama is not a republican
Huckabee does win
a man does not win
Clinton beats Obama or does not win
Paul does not smoke or dance

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```
a man does not smoke or dance
a republican helps McCain
if some woman beats Obama then a woman wins
every voter in Washington selects Obama
```

Be sure to use the features of nltk described in Chapter 12 of Bird (see especially section 12.7). Illustrate how your program works by displaying the results of evaluating all of the above sentences.