LING 364: Introduction to Formal Semantics

Lecture 13

February 23rd

Administrivia

- Homework 3
  - due next Thursday
  - email (midnight deadline)

Administrivia

- ***Worried about your grade?***
- **Course Philosophy**
  - Use the homeworks to **learn** and **practice** using what we've talked about in class
  - If you perform well on the homework, great!
  - If you understood the material but didn't do so well, there will be a second opportunity to display your understanding
  - **Idea**: you are not penalized for learning
- **There will be a take-home final (given out May 2nd):**
  - if you didn't do so well on the homework but perform well on the equivalent question on the take-home final, your homework score will be ***up-scaled*** (for the purposes of computing your final grade)
  - this second opportunity idea makes it possible to still get an A

Homework 3

- Assume ***basically***[1] the phrase structure and meaning grammars given in Homework 2 Review (lecture 12)

- [1] Note: use the following two grammars: the grammars given here are lightly customized versions of those given in lecture 12 to make the homework work out better

Phrase Structure Grammar

- **Starting point**
  - *from lecture 12 slides*
- sbar(**sbar(NP,S)**) --> wh_np(**NP**), s(**S**).
- sbar(**sbar(S)**) --> s(**S**).
- s(**s(VP)**) --> vp(**VP**).
- s(**s(NP,VP)**) --> np(**NP**), vp(**VP**).
- wh_np(**np(who)**) --> [who].
- np(**np(john)**) --> [john].
- np(**np(pete)**) --> [pete].
- np(**np(mary)**) --> [mary].
- np(**np(Det,N)**) --> det(**Det**), n(**N**).
- np(**np(Neg,NP)**) --> neg(**Neg**), np(**NP**).
- np(**np(NP1,Conj,NP2)**) --> np(**NP1**), conj(**Conj**), np(**NP2**).
- neg(**neg(not)**) --> [not].
- conj(**conj(and)**) --> [and].
- vp(**vp(V,NP)**) --> v(**V**), np(**NP**).
- v(**v(is)**) --> [is].
- det(**det(a)**) --> [a].
- n(**n(student)**) --> [student].
- n(**n(baseball_fan)**) --> [baseball,fan].

Meaning Grammar

- **Starting point**
  - *from lecture 12 slides*
- saturate1(**(**P1**,**P2**)**,X) :- **!**, saturate1(P1,X), saturate1(P2,X).
- saturate1(**(\+** P**)**,X) :- **!**, saturate1(P,X).
- saturate1(P,X) :- arg(1,P,X).
- sbar(**P**) --> wh_np(**X**), s(**P**), {saturate1(**P**,**X**)}.
- sbar(**P**) --> s(**P**).
- s(**P**) --> vp(**P**).
- s(**P**) --> np(**X**), vp(**P**), {saturate1(**P**,**X**)}.
- np(**john**) --> [john].
- np(**pete**) --> [pete].
- np(**mary**) --> [mary].
- np(**P**) --> det(**a**), n(**P**).
- np(**(\+ P)**) --> neg, np(**P**).
- np(**(P1,P2)**) --> np(**P1**), conj(**and**), np(**P2**).
- wh_np(**_X**) --> [who].
- neg --> [not].
- conj(**and**) --> [and].
- vp(**P**) --> v(**copula**), np(**P**).
- v(**copula**) --> [is].
- det(**a**) --> [a].
- n(**student(_X)**) --> [student].
- n(**baseball_fan(_X)**) --> [baseball,fan].

_X is a variable:
leading underscore prevents warning messages about singleton variables
! is the cut symbol:
prevents Prolog from trying other cases when looking for more solutions

Homework 3

- We'll do exercises 1 and 2 in class today.
- You'll do exercises 3 and 4
- Exercise 5 is extra-credit

- I've also tentatively reserved the Computer Lab classroom for next Thursday (3:30pm – 4:45pm)
  - for Homework 3 questions

Exercise 1

- **Part A:**
- (3pts) Modify the phrase structure grammar to handle
  - (1) Shelby is small
  - (2) Shelby is a dog
  - (3) Hannibal is a dog
- Use the following phrase structure for (1):
  - $[_{Sbar}\ [_{S}\ [_{NP}$ Shelby$][_{VP}\ [_{V}$ is$]\ [_{AP}\ [_{A}$ small$]]]]]$
  - AP = adjectival phrase, A = adjective

- **Part B:**
- (3pts) Modify the meaning grammar to handle examples (1)–(3)
- For parts (A) and (B), submit the grammars as well as the Prolog execution

Exercise 2

- **Possible worlds**
  - recall (from homework 1)
    - `?- assert(Fact).` adds Fact to the database
    - `?- retract(Fact).` removes Fact from the database
- **(3pts) Part A**
- Use your meaning grammar to interpret and add the Prolog equivalent of examples (1) through (3) from Exercise 1
  - e.g. `?- sbar(M,[shelby,is,a,dog],[]), assert(M).`
  - should result in fact

    `dog(shelby).`
  - being added to the database
    - check with `?- listing.` or `?- dog(X).`
- Submit your Prolog execution and database check

Exercise 2

- **Possible worlds**
  - Prolog built-in call/1
    - `?- call(Fact).` true if `Fact` is provable from the database (false, otherwise)
- **(5pts) Part B**
- Modify your meaning grammar to get answers to the following questions (given the facts in Part A):
  - (4a) Who is small and a dog?
  - (4b) Who is a dog and not small?
  - e.g. `?- sbar(Q,[who,is,small,and,a,dog],[]), call(Q).`
  - should come back with `shelby` as an answer
  - **Note**: your `Q` should be something like: `(small(X),dog(X))`
  - **Note**: you need to handle the semantics for "*not small*"
- Submit your Prolog execution

Exercise 3

- **Relative Clauses**
- **Part A (4pts)**
- Modify your phrase structure and meaning grammars to parse:
  - (5) Shelby saw Hannibal

- **Part B (6pts)**
- Modify your phrase structure and meaning grammars to parse:
  - (6) Hannibal is who Shelby saw
- Submit your grammars and the Prolog execution

Exercise 4

- **Adjectives (Intersective interpretation)**
- (6pts) Modify your phrase structure and meaning grammars to handle:
  - (7) Ossie is a bird `bird(ossie).`
  - (8) Ossie is tall `tall(ossie).`
    - *tall*: predicative adjective
  - (9) Ossie is a tall bird
    - tall: attributive adjective (modifies noun *bird*)
    - use the **intersective intepretation** here
    - use (simplified) phrase structure
    - *a tall bird* $[_{NP}\ [_{Det}\ a][_{N}\ [_{A}\ tall][_{N}\ bird]]]$
- Submit your grammars and the Prolog execution

Exercise 5

- **Extra Credit (10pts)**
- Modify your meaning grammar to handle
  - (9) Ossie is a tall bird
- with the semantics of “tall” being relativized for “birds”
- i.e. compute some meaning expression where the truth conditions are that:
  - (A) Ossie is a bird
  - (B) Ossie is tall with respect to birds in general
  - e.g.

    you could use the “average bird” idea discussed in lecture 12

Homework 3

- **Summary**
  - Exercise 1: 6pts
  - Exercise 2 (Possible Worlds): 8pts
  - Exercise 3 (Relative Clauses): 10pts
  - Exercise 4 (Adjectives): 6pts
  - TOTAL: 30 pts
- **Extra Credit**
  - Exercise 5: 10pts