Administrivia

• Homework 3
  – due next Thursday
  – email (midnight deadline)
• *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 \( \text{bird(ossie)}. \)
  - (8) Ossie is tall \( \text{tall(ossie)}. \)
    • *tall*: predicative adjective
  - (9) Ossie is a tall bird
    • *tall*: attributive adjective (modifies noun *bird*)
    • use the **intersective interpretation** here
    • use (simplified) phrase structure
      • *a tall bird* \( \text{[NP [Det a][N [A tall][N bird]]]} \)

• 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