LING 364: Introduction to Formal Semantics

Lecture 17

March 9th

Administrivia

- **No class next week**
  - Have a good Spring break!
  - next lecture: 21st March (in Comm 214)

Last Time

- **we began looking at**
  - Chapter 5: Complexities of Referring Expressions

Today's Topic

- Exercises for Chapter 5
- Quiz #4 at the end

Last Time

- **Definite NPs**
  - begin with a definite article ("the")
  - refer or "point" to some entity (in some world)
  - **Examples**
    - the dog the old man the picture of Mary
    - the woman who Susan knows I met
- **Predicates**
  - *cute*: cute(X). *or* λx.x cute
  - *dog*: dog(X). *or* λx.x a dog
- **What is the role played by "*the*"?**
  - The dog is cute cf. *dog is cute
  - **Semantic function of "the"**:
    - "the" is a function (a **robot** in Chapter 5's terms)
    - takes a property, e.g. dog(X), and picks out an individual in the world, e.g. `dog42`
  - **Example**
    - The dog is cute ⇒ The `dog(X)` is `cute(Y)` ⇒ `dog42` is `cute(Y)` ⇒ `cute(dog42).`

Sense and Reference

- **Imagine a world**
  - Shelby is the only dog which lives at Paul's house
- Then same truth conditions for:
  - (1) Shelby is cute
  - (2) The dog which lives at Paul's house is cute

- **Imagine a different world**
  - Paul adopted a different dog, Hannibal
- Then (1) and (2) are not equivalent
  - (2) The dog which lives at Paul's house is cute
  - (2') Hannibal is cute
  - The truth of statement (2') is independent from (1)

- **Conclusion**
  - Shelby and The dog which lives at Paul's house don't have the same meaning

Sense and Reference

- Reference:
  - a semantic object
  - e.g. `shelby`, `dog42`
- Sense:
  - computes reference
  - given a definite description and the state of the world, produce the right or “salient” reference
  - e.g. given
    - definite description: The dog which lives at Paul’s house
    - situation (or world): Shelby is the only dog which lives at Paul’s house

    compute
    - reference: `shelby`

Sense and Reference

- Sense:
  - computes reference
  - e.g. given
    - definite description: The dog which lives at Paul's house
    - situation (or world): Shelby is the only dog which lives at Paul's house

    compute
    - reference: `shelby`
- **Definite description**
  - The dog which lives at Paul's house
  - *what must be true in the world*?
    - must be some X such that
      1. `dog(X).` is true
      2. `lives_at(X,house(paul)).` is true
      3. must be only one such X

Exercises

- **Given grammar**: (*first attempt*)
  - `np(M) --> [the], n(M).`
  - `np(M) --> name(N), ['''s'], n(M), {saturate1(M,N)}.`
  - `np((M1,M2)) --> np(M1), rel_clause(M2), {saturate1(M1,X), saturate1(M2,X)}.`
  - `n(dog(_X)) --> [dog].`
  - `n(house(_X)) --> [house].`
  - `name(paul) --> [paul].`
  - `name(mary) --> [mary].`
  - `rel_clause(M) --> [which], subj_s(M).`
  - `subj_s(M) --> vp(M).`
  - `vp(M) --> v(M), np(Y), {saturate2(M,Y)}.`
  - `v(lives_at(_X,_Y)) --> [lives,at].`
  - `saturate1(P,Y) :- arg(1,P,Y).`
  - `saturate2(P,Y) :- arg(2,P,Y).`

Exercise 1

- Given the meaning grammar in the previous slide
  - How do ask Prolog what the semantics of (1) and (2) (below) are?
  - (1) the dog
  - (2) the dog which lives at Paul's house

- Queries
- (1)
  - `?- np(M,[the,dog],[]).`
- (2)
  - `?- np(M,[the,dog,which,lives,at,paul,'\'s',house],[]).`

Exercise 2

- Create a world where Shelby is the dog that lives at Paul's house
  - **Note**: use `assert/1` to add the relevant facts to the database

- add facts
  - `dog(shelby).`
  - `lives_at(shelby,house(paul)).`

Exercise 3

- How do we evaluate the meaning of (1) and (2):
  - (1) the dog
  - (2) the dog which lives at Paul's house
- for the scenario in Exercise 2
- [*What is incomplete about the meaning grammar so far*?]

- Queries:
  - `?- np(M,[the,dog],[]), call(M).`
  - `?- np(M,[the,dog,which,lives,at,paul,'\'s',house],[]), call(M).`

Exercise 4

- **Question:**
  - *What is incomplete about the meaning grammar so far*?
- **Answer:**
  - **the** dog should be unique

- **Question**:
  - *show a possible world that contradicts the meaning*
  - ***Hint**: add facts...*

Exercise 5

- **Question:**
  - *What is incomplete about the meaning grammar so far*?
- **Answer:**
  - **the** dog should be unique

- **Question**:
  - *what semantics is the meaning grammar computing*?
- **Answer:**
  - **a** dog which lives at Paul's house

- **Let's modify the grammar...**

Exercise 5

- Use findall/3 and length/2
  - findall(X,P,List).
  - length(list,N).

  - ?- findall(X,dog(X),List), length(List,1).

Quiz 4

- **Assuming**
  - s(P) --> name(N), vp(P), {saturate1(P,N)}.
  - vp(P) --> v(copula), np_pred(P).
  - np_pred(cute(_X)) --> [cute].
  - v(copula) --> [is].
- (1) What would you need to add to make this query work?
  - ?- s(M,[shelby,is,cute],[]).

Quiz 4

- (2) Describe in words (or implement)
- What would you need to change to make this query work?
  - ?- s(M,[the,dog,which,lives,at,paul,'\'s',house,is,cute],[]).