Communication
Announcements

The final exam is Monday, May 13 4-7PM in SERC 205
Review

Explanation-based learning

Reinforcement learning
Communication

Communication is an action, just like grab or move, but its effect is on the mental state of another agent.

- **Goal**: kill wumpus
- **Method**: other agent shoots wumpus
  - **Subgoal**: other agent sees wumpus
  - **Method**: other agent looks South
    - *subgoal*: other agent thinks something interesting is to the south
      - **Method**: shout “Behind you”

What are the goals and methods in the other agent?
Speech Acts

• Inform
  – warn
  – answer
• Ask (a question)
• Promise
• Request (an action)
• Marry
• etc.
Steps in Communication

- Intention: Speaker (S) chooses to speak as a means to a goal
- Generation: choice of words
- Synthesis: saying or writing words
- Perception: Hearer (H) perceives the sounds
- Analysis: determine possible meanings
- Disambiguation: decide which possible meaning was meant
- Incorporation: H updates his knowledge base
Understanding

Understanding: Perception, Analysis, Disambiguation, Incorporation Key Issues:

- Many levels of structure / processing
- Much ambiguity
Levels

• morphological analysis (parts of words)
• lexical analysis (words)
• syntactic analysis (grammar, parsing)
• semantic analysis (surface meaning)
• pragmatic analysis (meaning in context)
• discourse analysis (structure over multiple statements, coherence)
morphological analysis

Parts of words that signal grammatical and other information

slithy toves

*****y *****s
| | |
| | "This is a plural"
| "this is an adjective"

Ambiguity:

Mary loves
lexical analysis

Structure: The lexicon: words, grammatical role(s), meaning(s)

Ambiguity: saw “I saw the saw.”
Grammar

English grammar is much more complex than any formal language.

You have to handle ungrammatical sentences.

Ambiguity: “Time flies like an arrow”
semantic analysis

Combine meanings of words $\Rightarrow$ meaning of sentence

Ambiguity: You can fool some people all of the time.

Anaphora: pronouns, abstract nouns (“the hammer”), etc.
Using knowledge about the situation in which the sentence is said to disambiguate:

He works in the city.

Stop him! (said as a man runs by)
discourse analysis

How the successive sentences of a connected text are related

Coherence relations:

• enablement
  I opened the door. I saw a crowd of angry people.

• evaluation
  First I will describe the prerequisites. You must know how to program.

• causal
  I saw a crowd of angry people. I slammed the door.

• explanation
I slammed the door. I was afraid they would attack me.

• elaboration

I was afraid they would attack me. I thought they might beat me up and take my gold.

Also applies to dialogues:

Signalling topic shift: “Getting back to what you mentioned earlier . . .”
Disambiguation Requires Knowledge

Each level of structure provides constraints that help disambiguate
Other uses of Natural Language

Information retrieval of Natural Language documents (e.g. web search)

word based / statistical approaches have been most successful