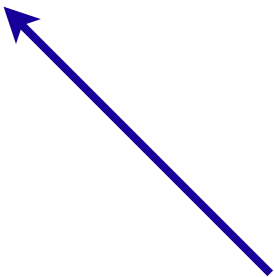


# Grounded Models of Meaning: Introduction

Alexander Koller  
14 April 2010

... but for the rest of the semester,  
you will do the talking!



# Before we start ...

- Please fill in the participant sheet:
  - ▶ your name
  - ▶ your matriculation number
  - ▶ what you are studying (BSc/MSc; what Studienordnung is relevant for you)
  - ▶ your semester
- This is so I can figure out who needs what kind of certificate.

# Outline

- Grounded models of meaning
- What do I expect?
- Elements of giving a good talk
- Distribution of talks

# Meaning: Classical semantics

- Meaning of sentence is represented as a logical formula:
  - ▶ “John sees a rabbit”  $\Rightarrow \exists x. \text{rabbit}'(x) \wedge \text{see}'(\text{john}', x)$
- Interpretation of constants like rabbit', see', john' enforced through logical axioms.
  - ▶  $\forall x. \text{rabbit}'(x) \Rightarrow \text{animal}'(x)$
- Well-known knowledge bottleneck problem.

# Meaning: Corpus-based approach

- Meaning of word is interpreted in terms of co-occurrence with other words.
  - ▶ “rabbit” is semantically similar with “mouse” because they co-occur with the same words
- What does this mean?
- Much of the meaning is not represented in corpora.

# Grounded models of meaning

- Semantics is about connecting words to things in the real world.
- Grounded models of meaning: map words to representations in a given domain.
- Domains may be concrete (real world) or abstract (sports tables).

# Advantages

- It is clear what “meaning” means.
- Knowledge bottleneck not particularly problematic; might even use domain observations to establish knowledge.
- Perhaps this is how people learn semantics.

# Challenges

- Identifying relevant patterns in the domain is hard and requires insights into other fields of AI.
- What part of the domain does a word refer to?
  - ▶ gavagai = rabbit?
  - ▶ = this particular rabbit?
  - ▶ = ears?
  - ▶ = grass?



“gavagai”

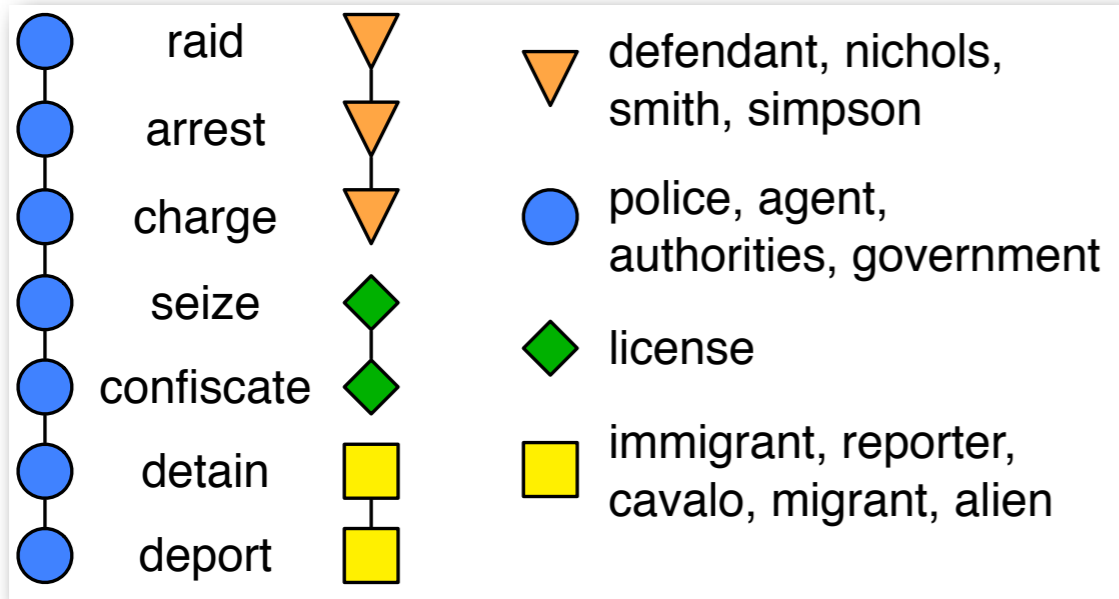
(Quine 1960)



# This seminar

- Part 1: Methods
- Part 2: Applications
- Part 3: Grounded parsing and generation

# Part I: Methods



## 28.4.: Ungrounded models



## 5.5.: Data acquisition from games



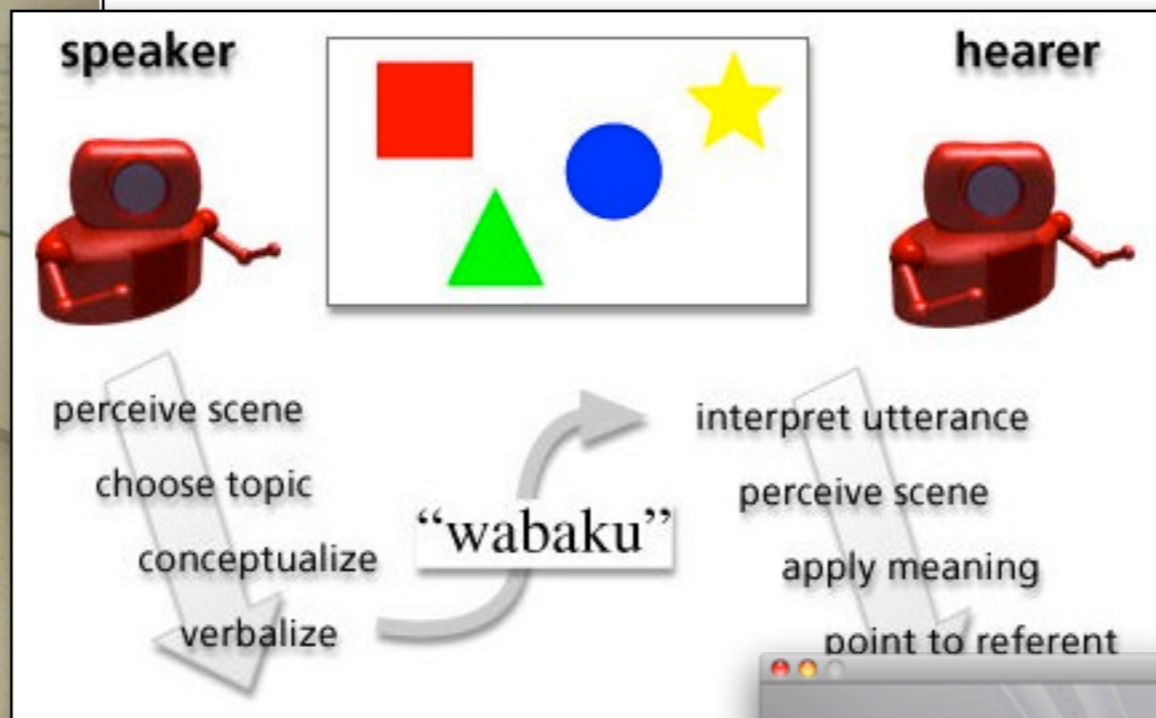
## 12.5.: Learning from visual data



# Part 2: Applications



Fig. 9. "Aha. I see a television."



26.5.:  
Language evolution



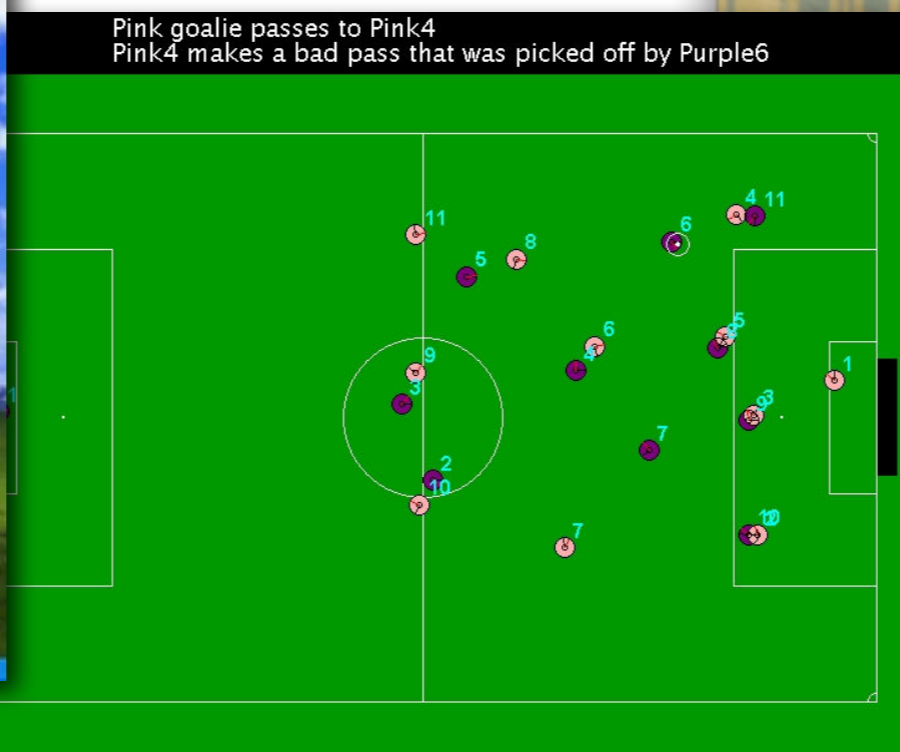
2.6., 9.6.: Virtual worlds

16.6.: Sports

19.5.: Language-learning robots



23.6.: Windows GUI actions



# Part 3: Parsing & Generation

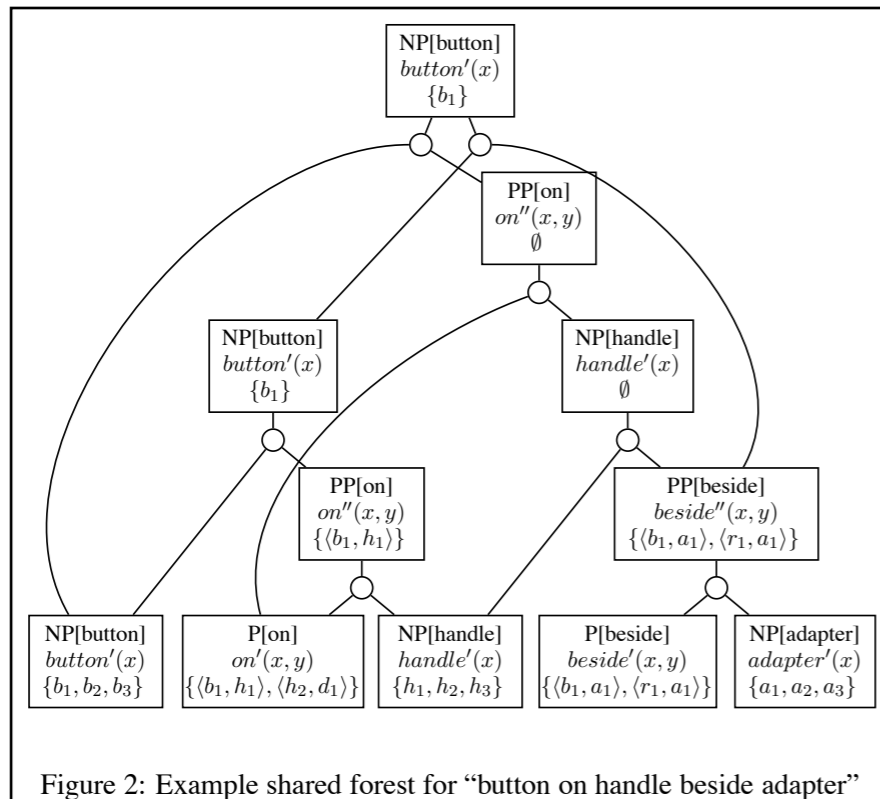


Figure 2: Example shared forest for “button on handle beside adapter”

## 30.6.: Parsing

time	most common phrase in corpus	phrase suggested by expert	phrase used in SUMTIME-MOUSAM
0000	by late evening	around midnight	by midnight
0300	tonight	in early hours	after midnight
0600	overnight	in early morning	by early morning
0900	by midday (**)	during morning	by (mid) morning (*)
1200	by midday	around midday	by midday
1500	by mid afternoon	in mid afternoon	by mid afternoon
1800	by evening	in early evening	by early evening
2100	by evening	during night	by (mid) evening(*)

## 21.7.: Generation

7.7., 14.7.: no class

# What do I expect?

- Grading:

50% talk & participation

50% seminar paper

- Deviations are possible for special cases; each of you needs to discuss this with me individually.

# Talk & presentation

- Every student gives a talk.
- Factors contributing to grade for talk:
  - ▶ correct and complete
  - ▶ easy to understand
  - ▶ lively and clear presentation (check the website!)
  - ▶ discussion
- I will also take your participation in other people's papers into account for the grade.

# Giving a seminar talk

- Point of giving a talk: Audience must understand what you're saying.
- A talk must be
  - ▶ well-motivated: Why should I care what you are saying?
  - ▶ clear: What are you saying?
- Everything else is in the service of these goals.

# Some golden rules

- Do not assume that hearers know as much as you do.
  - ▶ Imagine you're explaining the topic to a younger you who hasn't read the papers yet.
- Tell a story.
  - ▶ What's the problem? Why is it important? Why is it hard? How did we solve it? Why is the world now a better place?
- Use lots of examples to support your story.



# Seminar paper

- Presents the papers you talked about.
- Contains at least one idea of your own:
  - ▶ comparison of papers in the literature
  - ▶ implementation or corpus study
  - ▶ idea for extensions
  - ▶ may refer to someone else's talk
- Typical paper will have 15-20 pages.

# Procedure

- Two weeks before your talk or earlier:
  - ▶ be registered for class
  - ▶ come talk to me about what to take from each paper on the literature list
- One week before your talk:
  - ▶ come talk to me about your talk
  - ▶ preferably with draft of your slides
  - ▶ ideally send me slides by email before we meet
- Then give your talk.

# Schedule

- see the website