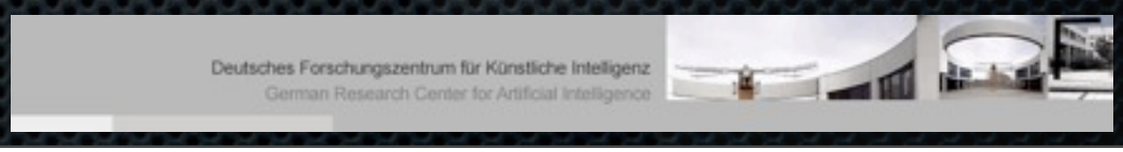
Phrasing Questions

Geert-Jan M. Kruijff, DFKI GmbH (Germany)
Michael Brenner, ALU Freiburg (Germany)

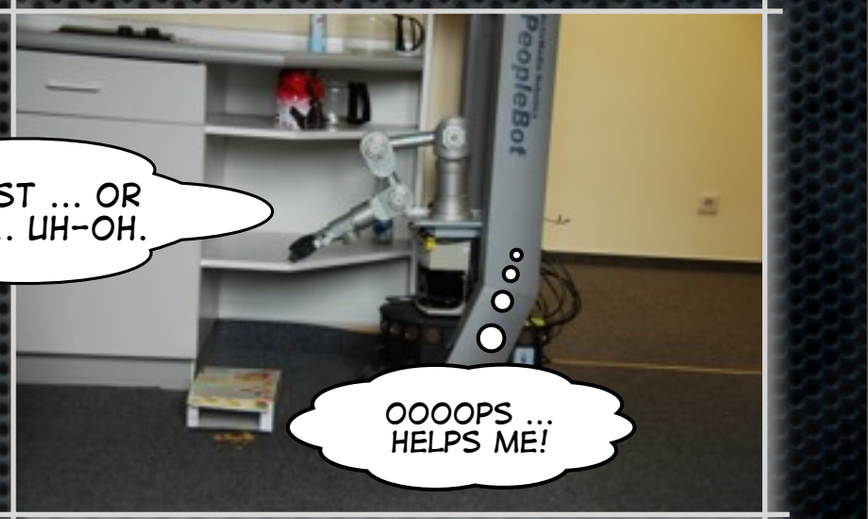


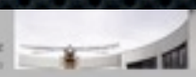
What are we working on?

- HRI & interactively learning systems
  - Robots that learn, about the environment, about acting
  - Scenario#1: Observing and manipulating objects
  - Scenario#2: Acting in the environment
  - Mix of internal motivation, meta-learning, interaction
- Socially guided machine learning
  - How to pop the question “the right way”?
  - Transparency: What the QUESTION is about
  - Scaffolding: What kind of ANSWER you are looking for
  - Set against a common ground between human & robot
  - **Main point: Phrasing a question is about more than trying to fill an “open argument”**

CogX: The cornflakes scenario

Deutsches Forschungszentrum für Künstliche Intelligenz
German Research Center for Artificial Intelligence






Vollmilch


ERR, ROBOT, COULD YOU GO AND GET US SOME KELLOG'S, EH, A BOX OF CORNFLAKES, PLEASE?
Vollmilch

interruptions / fragments, self-corrections ...

ERR, ROBOT, COULD YOU GO AND GET US SOME KELLOG'S, EH, A BOX OF CORNFLAKES, PLEASE?

interruptions / fragments, self-corrections ...

ERR, ROBOT, COULD YOU GO AND GET US SOME KELLOG'S, EH, A BOX OF CORNFLAKES, PLEASE?

"look ma, no ... bluetooth microphone"

interruptions / fragments, self-corrections ...

ERR, ROBOT, COULD YOU GO AND GET US SOME KELLOG'S, EH, A BOX OF CORNFLAKES, PLEASE?

"look ma, no ... bluetooth microphone"

the robot 'knows' that **this** Kai won't know where the kitchen is ... and the robot is too afraid to ask GJ for more information (for some strange reason)

interruptions / fragments, self-corrections ...

ERR, ROBOT, COULD YOU GO AND GET US SOME KELLOG'S, EH, A BOX OF CORNFLAKES, PLEASE?

"look ma, no ... bluetooth microphone"

the robot 'knows' that **this** Kai won't know where the kitchen is ... and the robot is too afraid to ask GJ for more information (for some strange reason)

... but he **does** know what's good for him, in terms of whom to serve first ...

The problem of phrasing questions

- A question is a dialogue
  - It isn’t (just) a single utterance
  - A question invokes a structure
    - Preparing why the question is being asked (explanation),
    - What is being asked (the question),
    - What information is looked for (the consequent answer)
  - Phrasing a question means:
    - Determining what needs to go into this structure,
    - And what can be left out as “implicitly understood”
- How do we represent that?

Representing questions

- What is a question?
  - Situations which a question *q* refers to
  - Propositions that potentially resolve *q*
  - Agent-relative notion of resolvedness: resolve against a common ground
- Formalising the question nucleus
  - The question is about some referent ***r*** (reference set)
  - **BL** is a set of beliefs associated with *q*
  - **XP** is a (continuous) plan for a question
  - **AS** is a set of propositions which potentially resolve *q*
- A question is more than a predicate structure

Determining context and content

- Determining **BL for r**
  - Given the common ground between the robot, human ...
  - Retrieve those beliefs that are about *r*
- Determining **AS for r**
  - Given BL, determine the potentially resolving answers
  - Using subsumption, organize AS by specificity
- Determining beliefs for scaffolding, transparency
  - Retrieve **RelBL**: beliefs from **BL** that yield maximally specific answers in **AS**
  - Beliefs for transparency: those beliefs in **RelBL** that are mutual beliefs
  - Beliefs for scaffolding: those beliefs in **RelBL** that are not mutual
  - Together with *q*, these belief sets provide the content for the nucleus

Conclusions

- Conclusions? What conclusions?
  - Phrasing a question needs to accomodate context, common-ground
  - Phrasing means making clear *what, why, and what for*
  - Using a notion of question, and question nucleus, see these as belief sets
  - Determining how to phrase involves context and content determination
- Connection to content planning
  - Not discussed in the paper, but present in the system
  - Current investigations: content planning including intonation contours
- Questions? What questions? ;)
- (Oh, and there MIGHT be a demo on Tuesday)