Giving Instructions in Virtual Environments

Session 5: Instruction giving as communicative interaction

Andrew Gargett
12/11/09

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- Recall previous lectures:
  - content selection
  - sentence planning
  - surface realisation

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Outline

- Motivations
- Aims
- A model of communication as grounding

  (i) collaborative discourse

  (ii) understanding contributions
- Instruction giving as communicative interaction

Motivations

Instruction giving as communication

- Communication being joint action, is *collaborative* (Clark 1996, Brennan & Clark 1996)

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➡ so, is instruction giving collaborative?

Instruction giving as communication

- Communication being joint action, is *collaborative* (Clark 1996, Brennan & Clark 1996)

➡ so, is instruction giving collaborative?

✓ Instruction giving is certainly joint action (more later)

- But is it collaborative?

Instruction giving as communication

- Communication is also about building relationships = *rapport* (Cassell et al. 2007)

Instruction giving as communication

- Communication is also about building relationships = *rapport* (Cassell et al. 2007)

  - How should we manage this during instruction giving?

Examples of instruction giving

- Instruction giving comes in a number of forms, such as

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- instruction manuals

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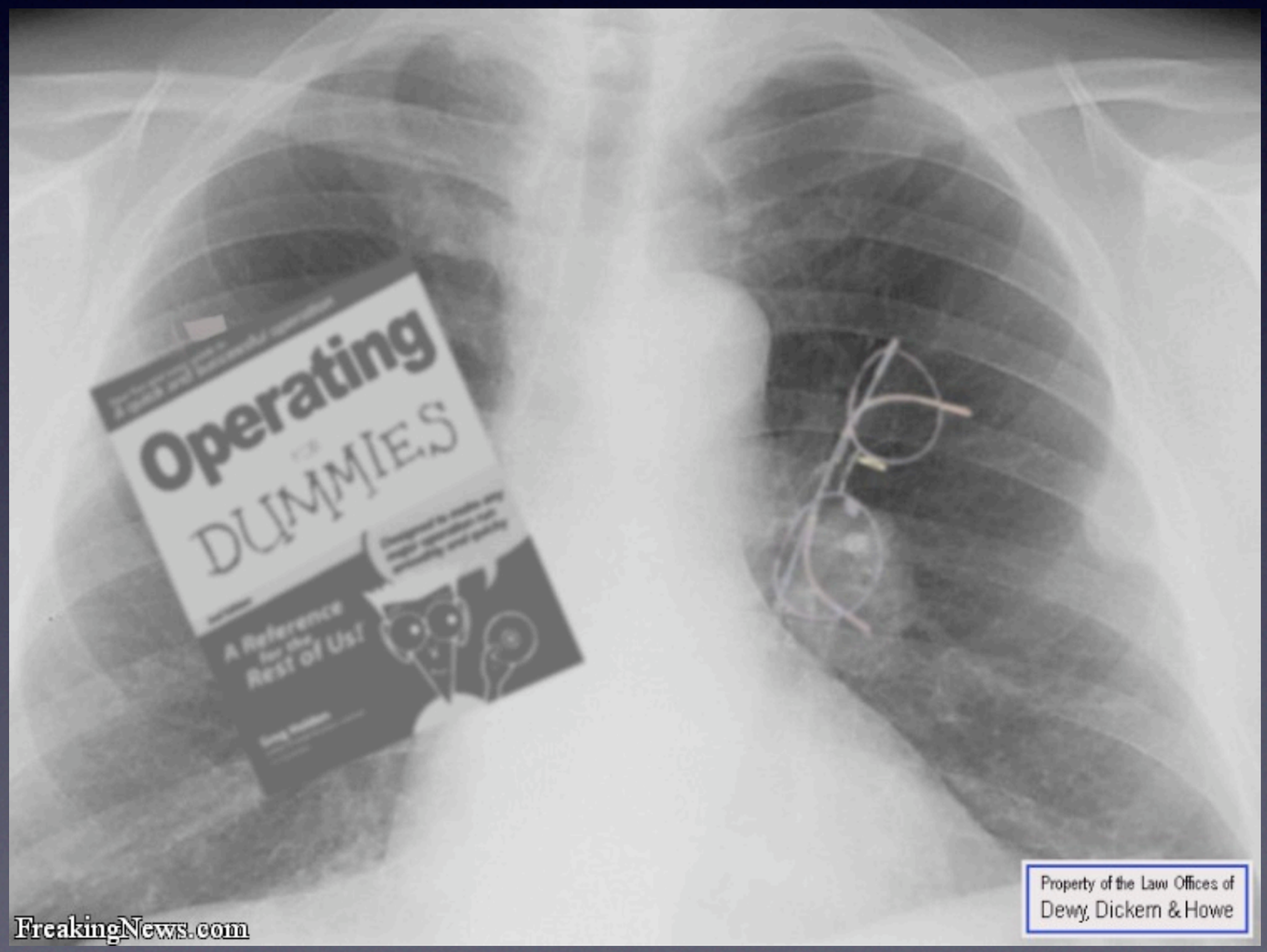
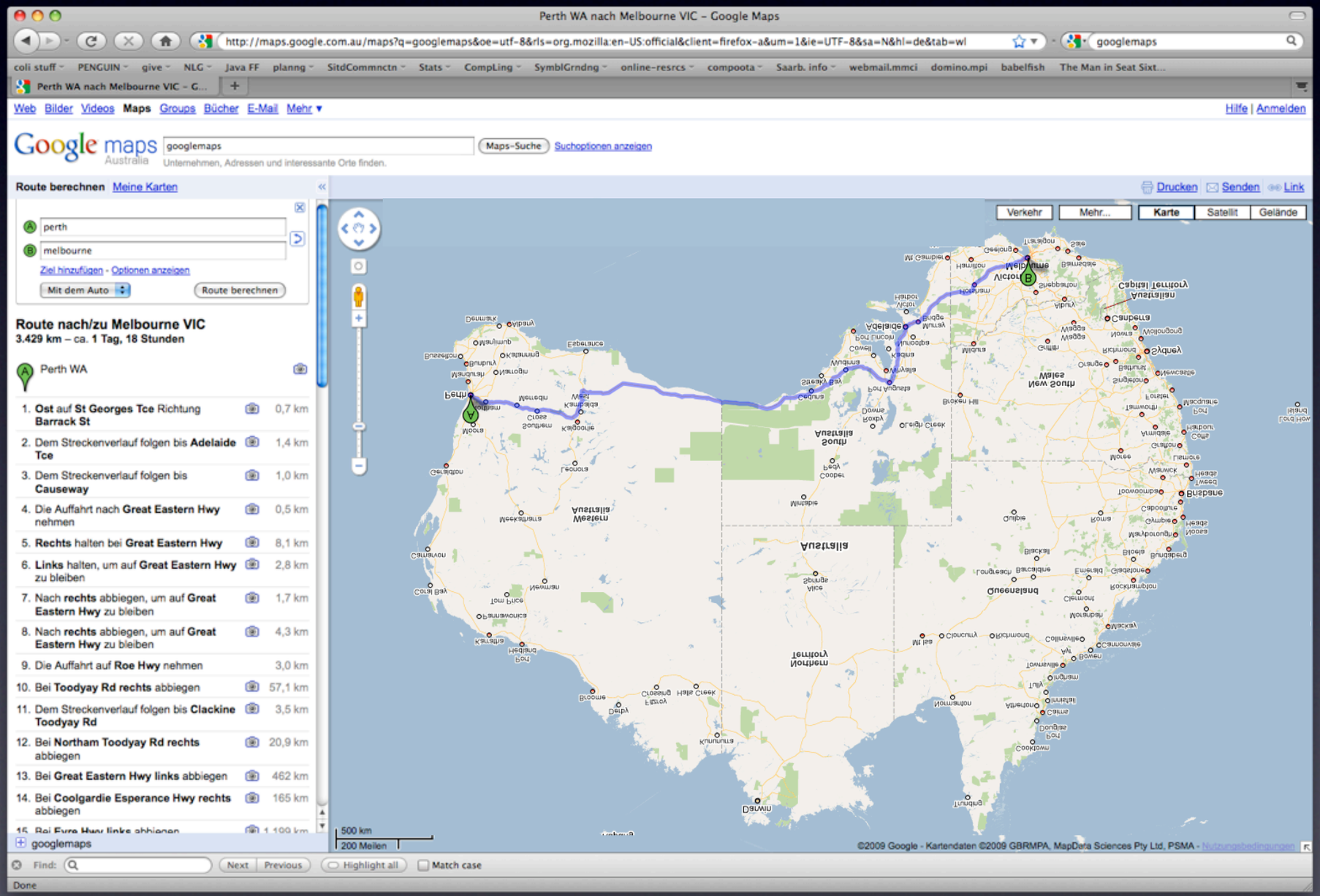


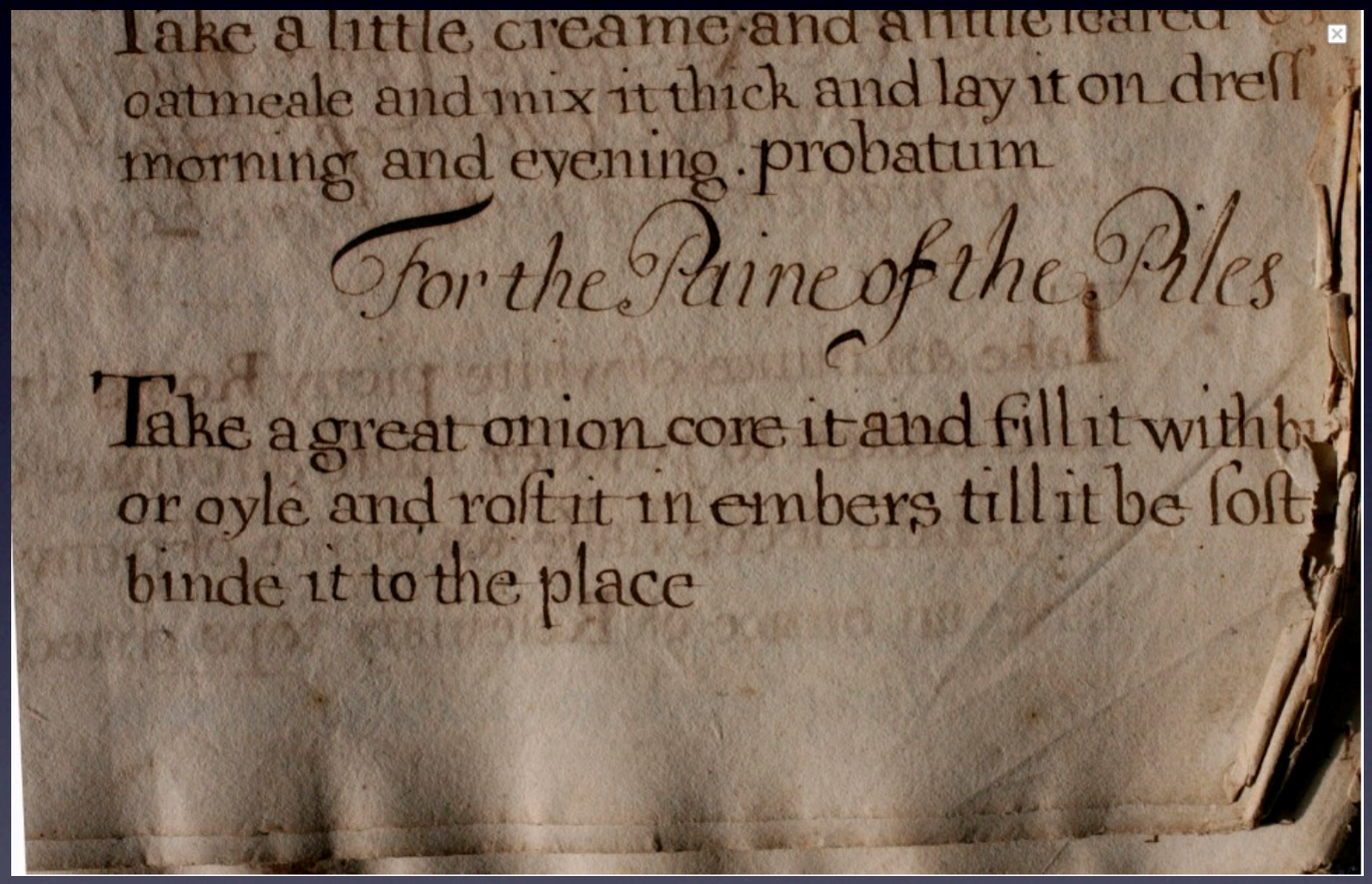
Examples of instruction giving

- map directions



Examples of instruction giving

- recipes

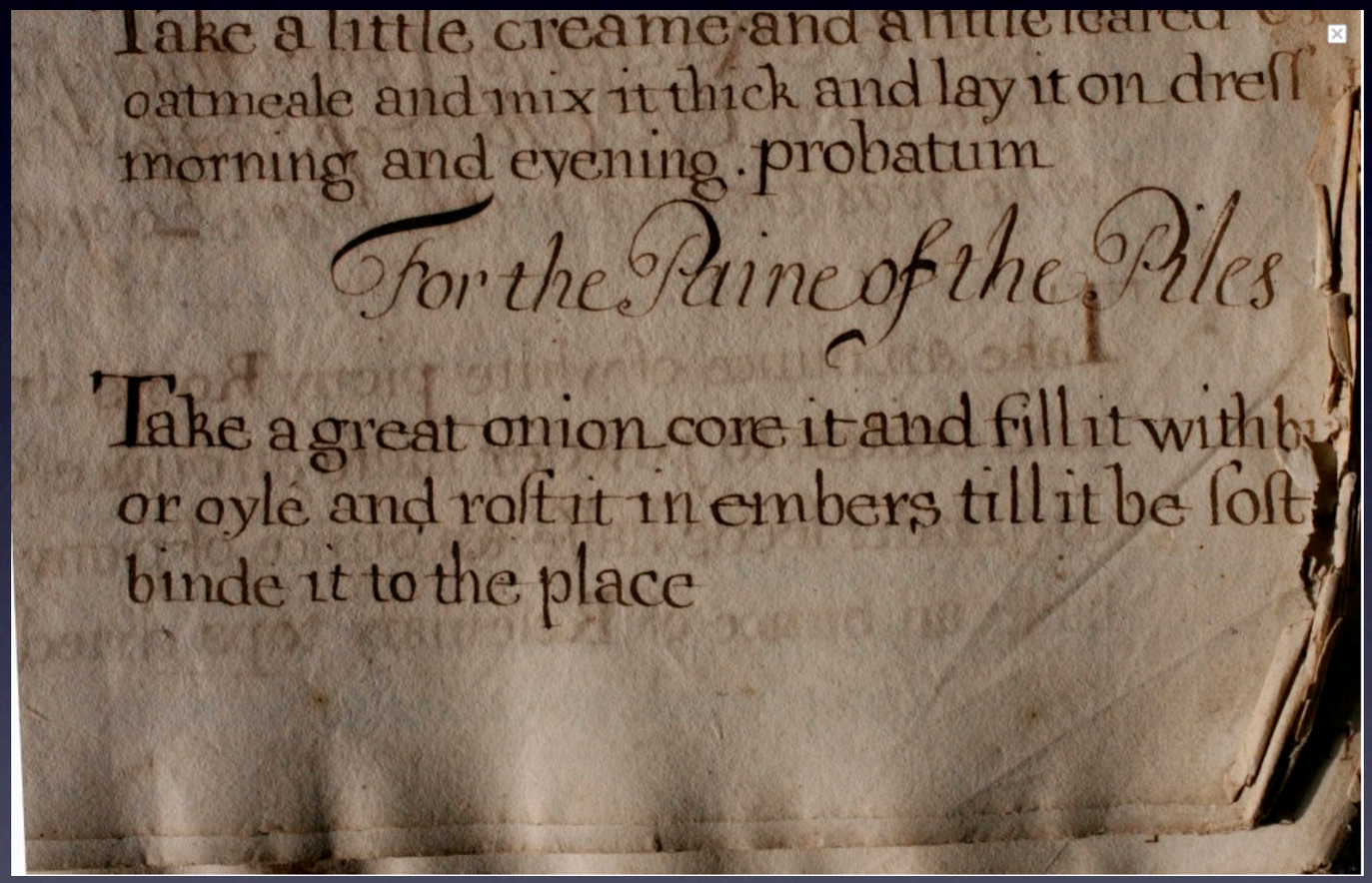

Take a little creame and a little beared
oatmeale and mix it thick and lay it on dress
morning and evening. probatum

For the Paine of the Piles

Take a great onion core it and fill it with h
or oyle and rost it in embers till it be soft
binde it to the place

Examples of instruction giving

- recipes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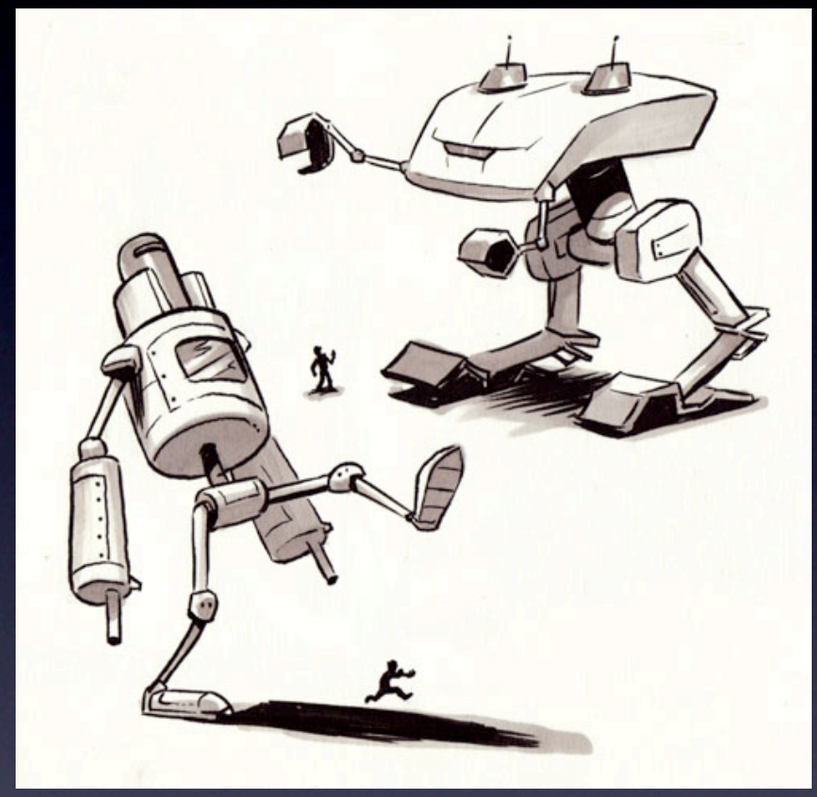
- None of these are *joint* action, nor particularly collaborative

Instruction giving as collaborative?

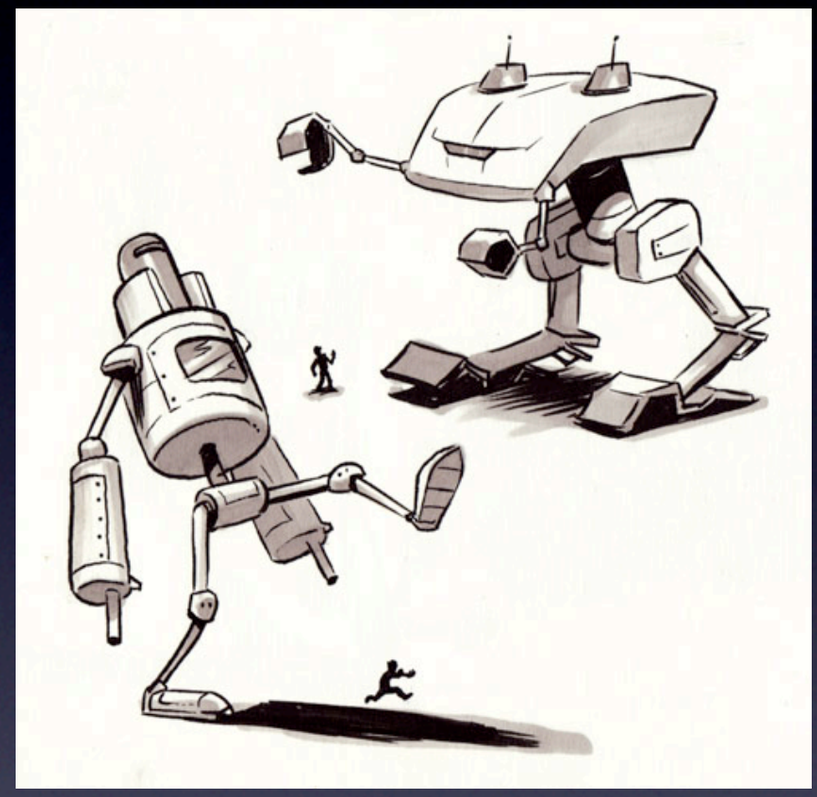
- *Situated* instruction giving as action control discourse:
  - Think of instruction followers as "naughty robots"
  - Then the job of an IG system is to control their actions



http://joebluhm.blogspot.com/2009/03/sketchbook-robots.html

Instruction giving as collaborative?

- *Situated* instruction giving as action control discourse:
  - Think of instruction followers as "naughty robots"
  - Then the job of an IG system is to control their actions
- Yet, all the while building rapport?



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Instruction giving as action control

Goal: IF pushes button b12 in room r2

1. Go forward one step
2. Stop
3. Turn left
4. Stop
5. Go forward one step
6. Stop
7. Go forward one step
8. Stop
9. ...

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1. We are going to push a blue button located in another room.
2. Turn until you see the door near the plant.
3. Turn further until you see the door.
4. Great. Now walk through it.
5. OK, the button is the one near...

Instruction giving as action control

Controlling and monitoring actions

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what counts as enough?

Instruction giving as action control

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what counts as enough?

how to give feedback?

Plus building rapport?

This is a bit more subtle...

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what counts as enough?

how to give feedback?

do we have rapport here?

Aims

- Let's investigate what might be required for instruction givers to:
  - be more collaborative
  - build rapport
- and all the while, adequately controlling the IF's actions

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Instruction giving as collaborative discourse

- Some characteristics of communication:

1. Joint activity, e.g. alignment
2. Minimising collaborative effort, e.g. truncation
3. Building relationships, i.e. rapport

Joint activity

- Alignment is a general phenomenon,

Alignment

- which is typically unconscious,

Alignment

- and seems fundamental to particular species.

Alignment in NLG

- "Modelling alignment for affective dialogue" (Brockmann et al. 2005)
- "Politeness and alignment in dialogues with a virtual guide" (Jong et al. 2008)
- "An Alignment-capable Microplanner for Natural Language Generation" (Buschmeier et al. 2009)

http://modpodgerocks.blogspot.com/2008/05/happy-robot-man.html

Alignment in NLG

- But what might alignment mean for action control discourse?

Alignment examples

- Other-Alignment:

  A:

  B:

- Self-Alignment:

  A:

  B:

Alignment examples

- Other-Alignment:

  A: tuer

  B:

- Self-Alignment:

  A:

  B:

Alignment examples

- Other-Alignment:

  A: tuer

  B: tuer

- Self-Alignment:

  A:

  B:

Alignment examples

- Other-Alignment:

  A: tuer tuer

  B: tuer

- Self-Alignment:

  A:

  B:

Alignment examples

- Other-Alignment:

  A: tuer tuer

  B: tuer tuer

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  B:

Alignment examples

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  A: tuer tuer tuer

  B: tuer tuer

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Alignment examples

- Other-Alignment:

  A: tuer tuer tuer

  B: tuer tuer tuer

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  A:

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Alignment examples

- Other-Alignment:

  A: tuer tuer tuer durchgang

  B: tuer tuer tuer

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Alignment examples

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Alignment examples

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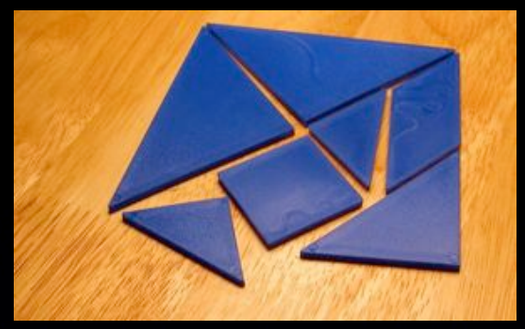
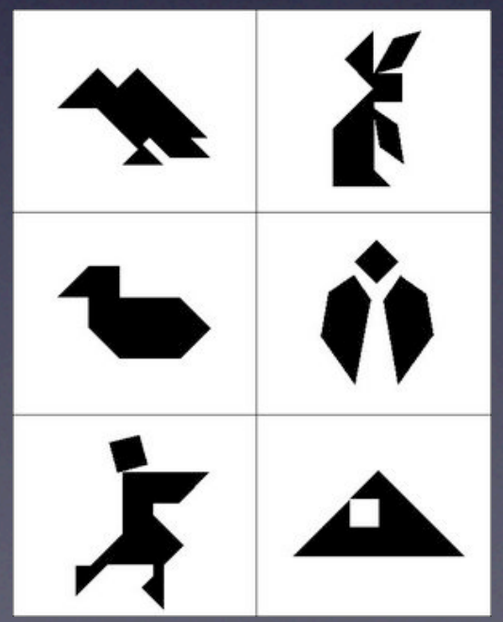
Minimal collaborative effort



- Interlocutors expend as much effort as "needed", but little more:

- Truncation during tangram experiments
  (Clark & Wilkes-Gibbs 1986)



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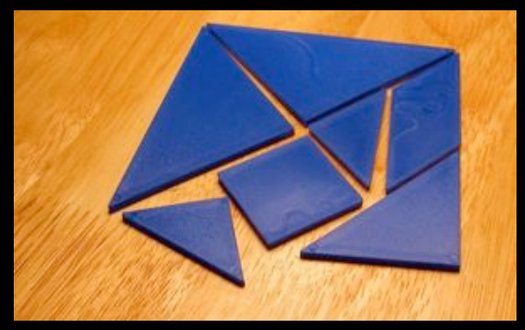

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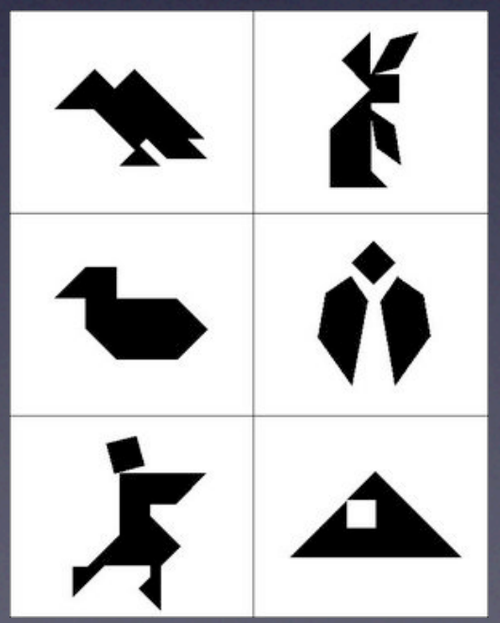
the blowing windmill figure



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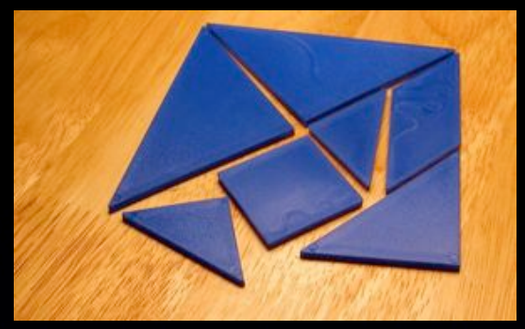

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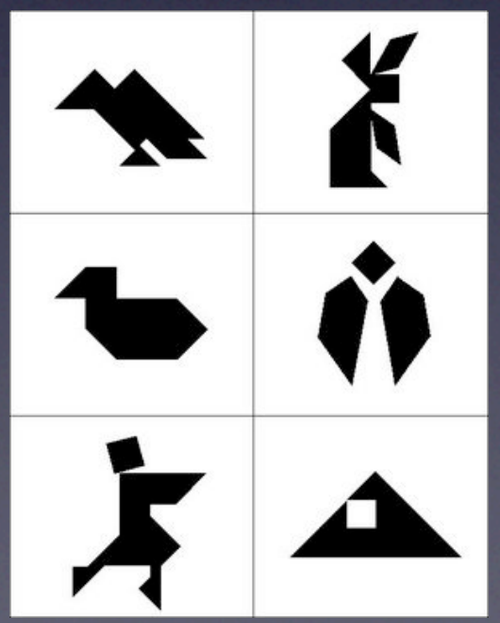

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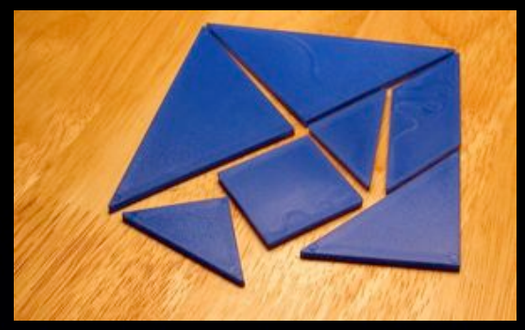

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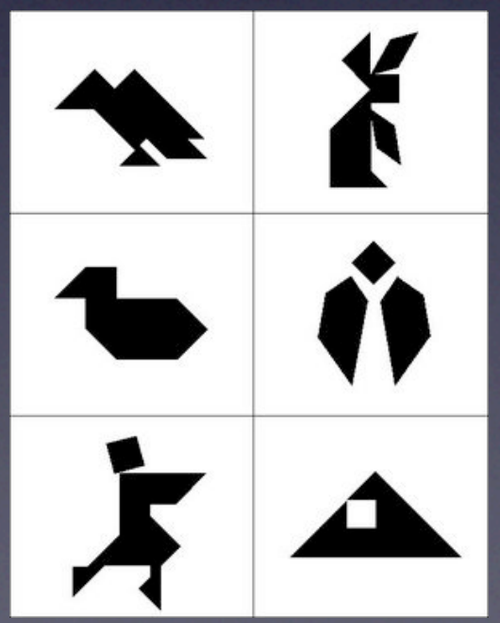

Truncation examples

- Truncation of turning instructions:

Truncation examples

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links, den rechts, den rechts

Truncation examples

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links, den rechts, den rechts

links, rechts, rechts

Truncation examples

- Truncation of turning instructions:

links, den rechts, den rechts

links, rechts, rechts

l, r, r

Truncation in NLG

- Keep it short and sweet?

1. Forward one step
2. Stop
3. Turn left
4. Stop
5. Forward one
6. Stop
7. Left
8. Stop
9. Forward
10. ...

Truncation in NLG

- or be more strategic?

1. We are going to push a blue button located in another room.
2. Turn until you see the door near the plant.

Truncation in NLG

- or be more strategic?

1. We are going to push a blue button located in another room.
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3. Turn further.

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4. Further.

Truncation in NLG

- or be more strategic?

1. We are going to push a blue button located in another room.
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3. Turn further.
4. Further.
5. Go through the door.

Truncation in NLG

- or be more strategic?

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truncate

$w_1 w_2 w_3$

$w_1 w_4$

w_4

And now for some good old-fashioned *rapport* building

- Cassell et al. (2007):

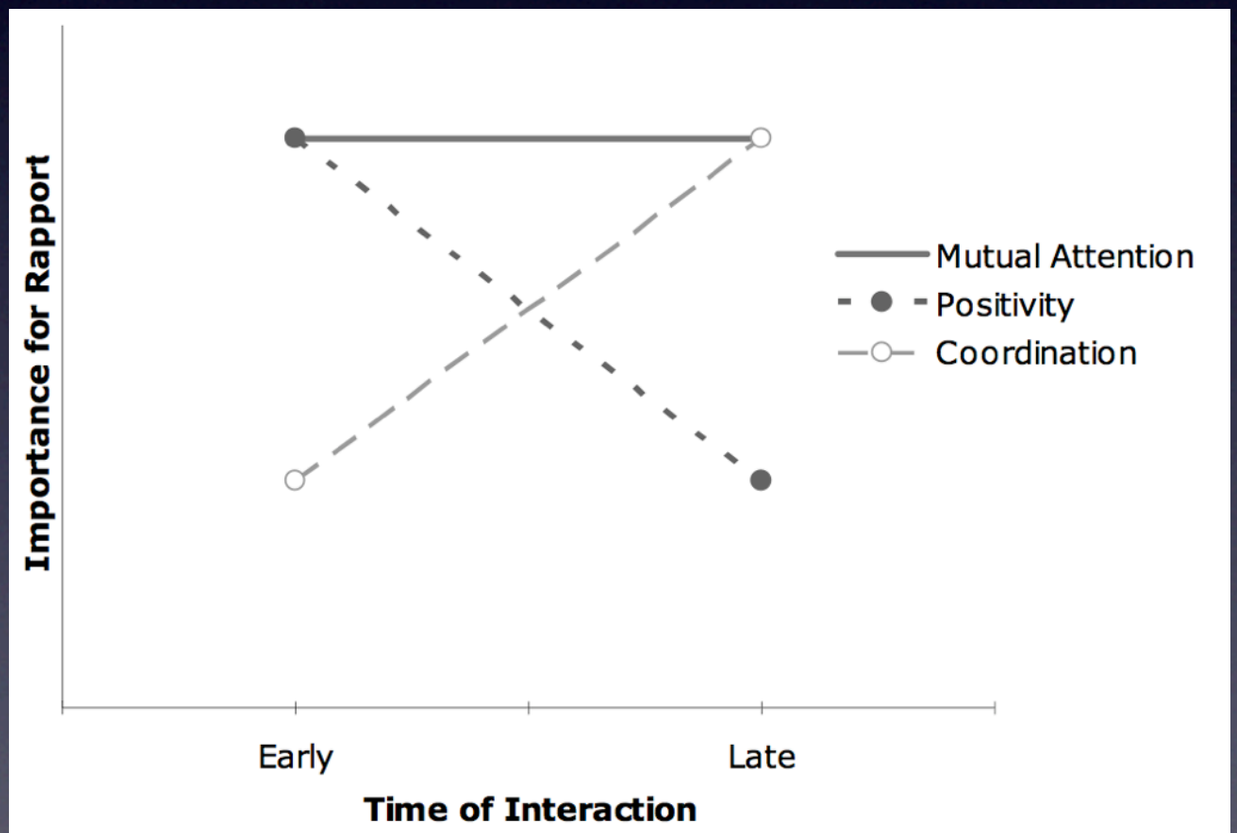

Figure 1. Three component model of rapport (from Tickle-Degen & Rosenthal, 1990).

And now for some good old-fashioned *rapport* building

- Cassell et al. (2007):

"strangers are more likely to be polite and uniformly positive in their talk, but also more likely to be awkward and badly coordinated with their interlocutors"

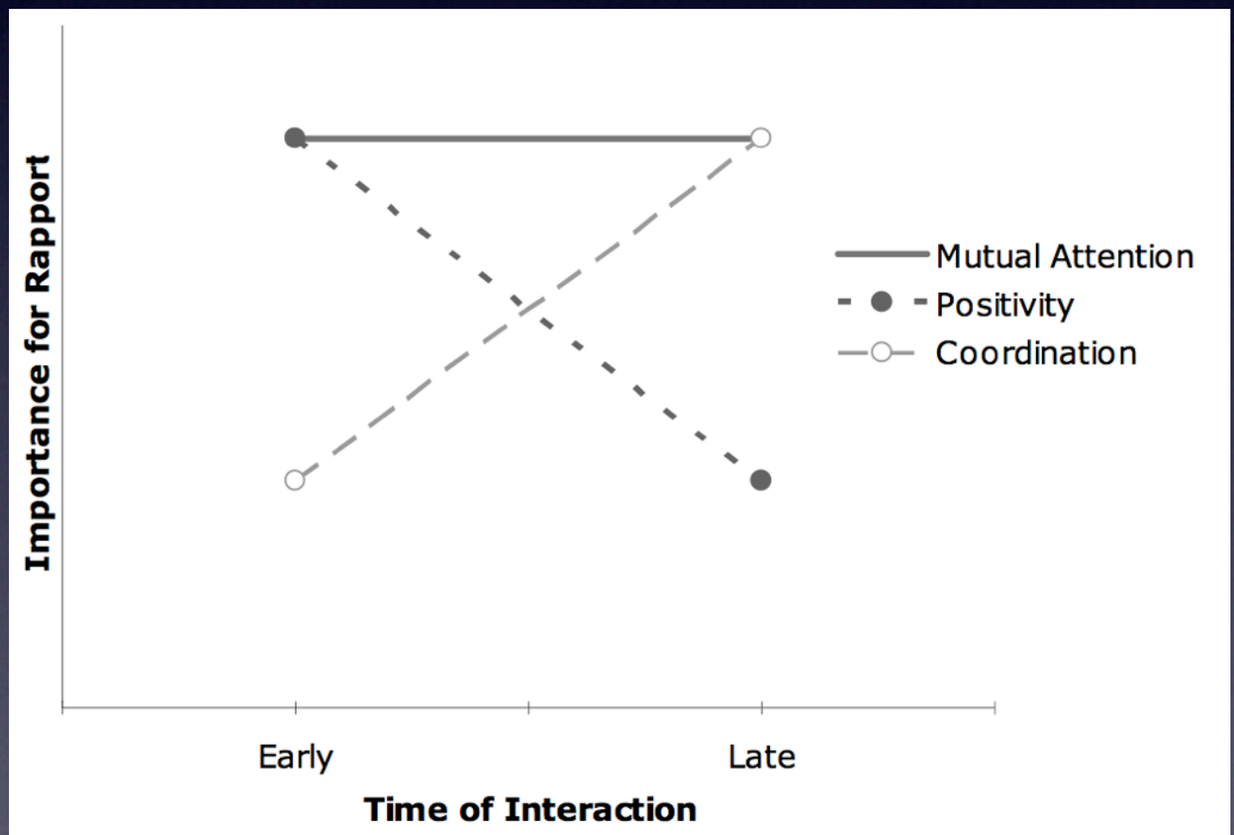

Figure 1. Three component model of rapport (from Tickle-Degen & Rosenthal, 1990).

And now for some good old-fashioned *rapport* building

- Cassell et al. (2007):

But, also need to distinguish:

instant rapport
("clicking")

vs.

long-term rapport
("mutual interdependence")

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Communication as grounding

- Interlocutors seek to establish *common ground*
- So understanding an interlocutor's contributions is a *grounding* problem (Clark 1996)

- Components of the grounding problem:

  (1) The *grounding criterion* (Clark & Shaefer 1989):

  > "The contributor and the partners mutually believe that the partners have understood what the contributor meant to a criterion sufficient for current purposes."

Communication as grounding

- Interlocutors seek to establish *common ground*
- So understanding an interlocutor's contributions is a *grounding* problem (Clark 1996)

- Components of the grounding problem:

  (2) Clark argues this requires *positive evidence* for understanding at different levels

  - Others might argue *negative* evidence is sufficient (e.g. Healey 2007)

Communication as grounding

- Grounding implies (Dillenbourg & Traum 2006):

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Communication as grounding

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  - communicative interaction
  - IG monitoring for evidence of IF's understanding
  - feedback (eg acknowledgement, repair, etc)

- Action control discourse: monitoring in the absence of (linguistic) feedback
- Whither grounding? what criteria?

Perhaps we just need a little understanding?

- We could combine control of action, with action understanding ("execution monitoring")

- For this, we might look into the literature on modelling action understanding during linguistic interaction
  (e.g. Funakoshi & Tokunaga 2006)

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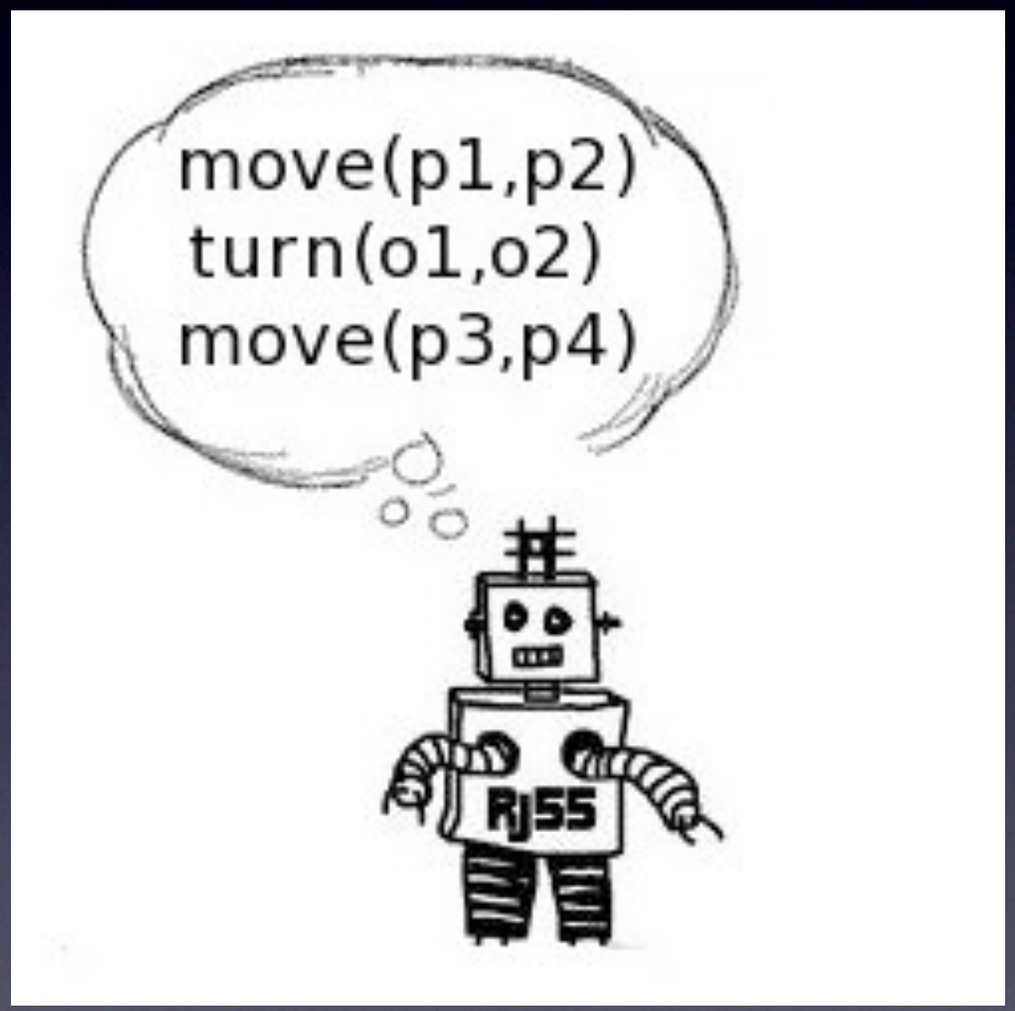
How might all/some of this help us?



Where might this help?

- Modelling how we say what we want to say is interesting, and non-trivial
- Empirical and conceptual issues
- We could look at what people *actually* do, when interacting with computers
- We need to be able to model this in an effective manner

Evidence from HCI

- Compared to interacting with other people, interlocutors interact with machines:
  - differently: more sensitive to silences (Porzel 2006)
  - similarly: tend to align more with "basic" systems (Pearson et al. 2006)
- So for action control dialogues, might they also respond to and follow instructions differently?

Instruction giving as communicative interaction

- Alignment and /or truncation might:

  (1) ease processing

  (2) provide more effective/efficient communication (e.g. entrainment, Porzel 2006)

  (3) increase rapport :-)

Summary

- We considered instruction giving as communication
- In particular, we focused on action control discourse
- We considered the possibility of exploiting communicative features of instruction giving for crafting more “natural” instructions

Summary

- How might instructions be packaged in the most efficient yet effective manner for IFs?
- For example, trading off self-alignment (reusing aspects of instructions) against truncation (making these less repetitive) might make instruction giving more collaborative, and build greater rapport
- But warning: recall that the simpler systems in GIVE-1 were actually quite successful...

Communication as grounding

- Some other models of grounding:
  - Grounding acts (eg Traum 1994, 1999)
  - PTT (eg Matheson et al. 2000)
  - Grounding by degrees (eg Roque & Traum 2008)