Human-Computer Interaction

Artificial Agents

Professor Bilge Mutlu

Today's Agenda

» Topic overview: *Artificial Agents*

» Discussion

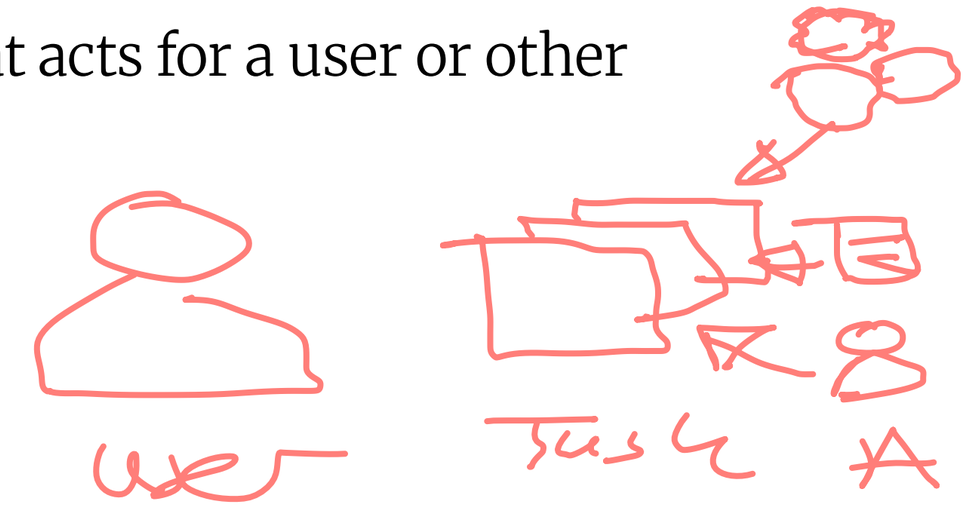
» Project Q&A, individual feedback

Topic overview: *Artificial Agents*

Why do we have to think about computers as agents?

Software agents

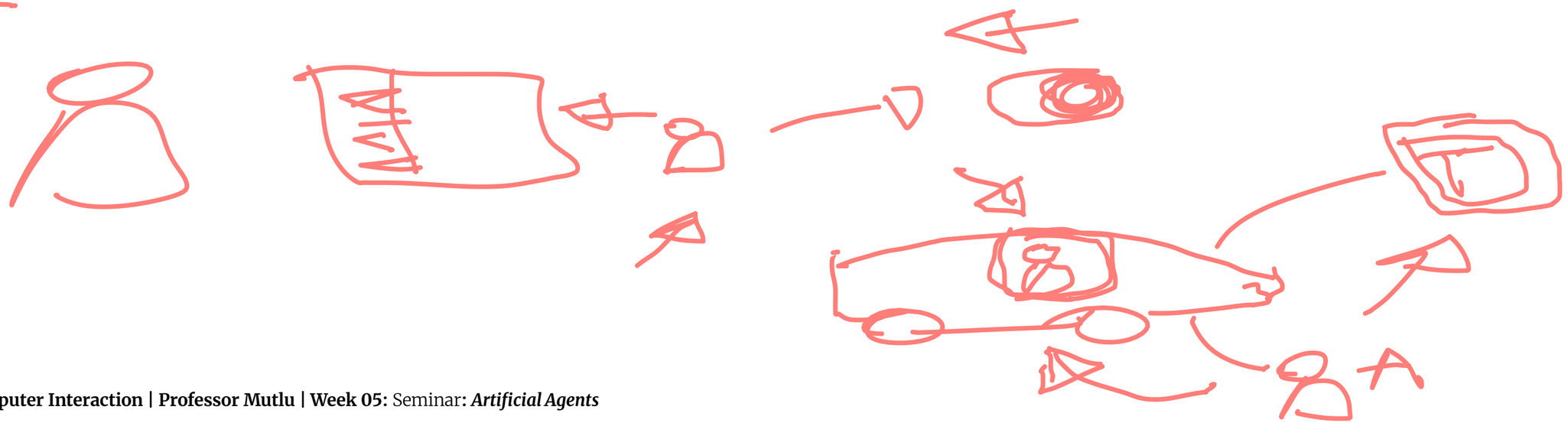
Definition: A software agent is a computer program that acts for a user or other program in a relationship of *agency*.



Agency

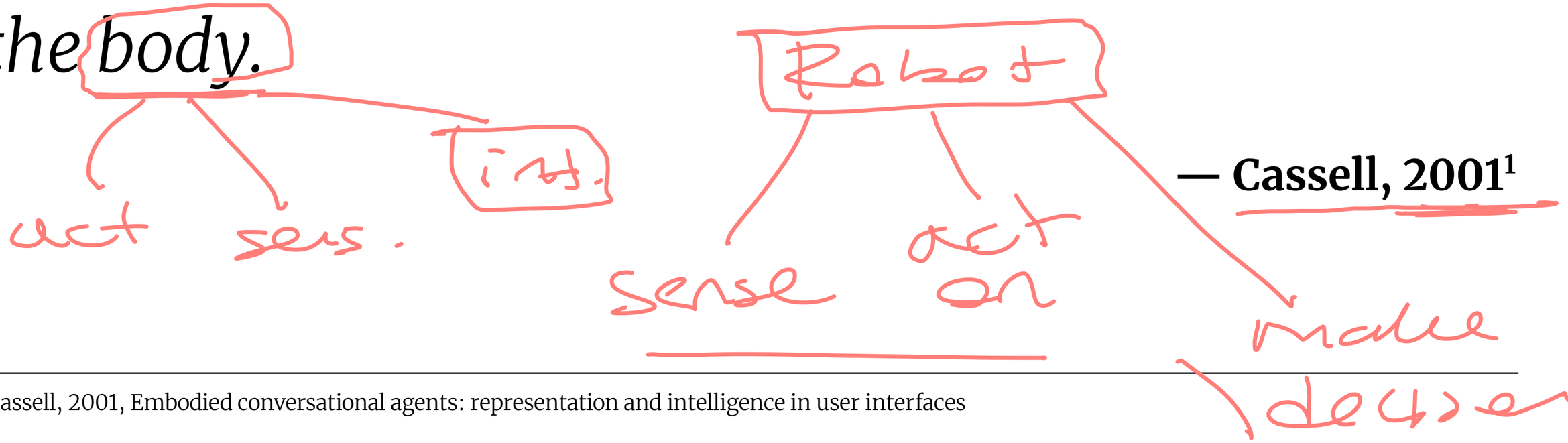
Definition: An agreement to act on one's behalf.

> *Agency implies intelligence, autonomy, decision-making*



Why do agents need bodies?

We need to locate intelligence, and this need poses problems for the invisible computer. The best example of located intelligence, of course, is the body.

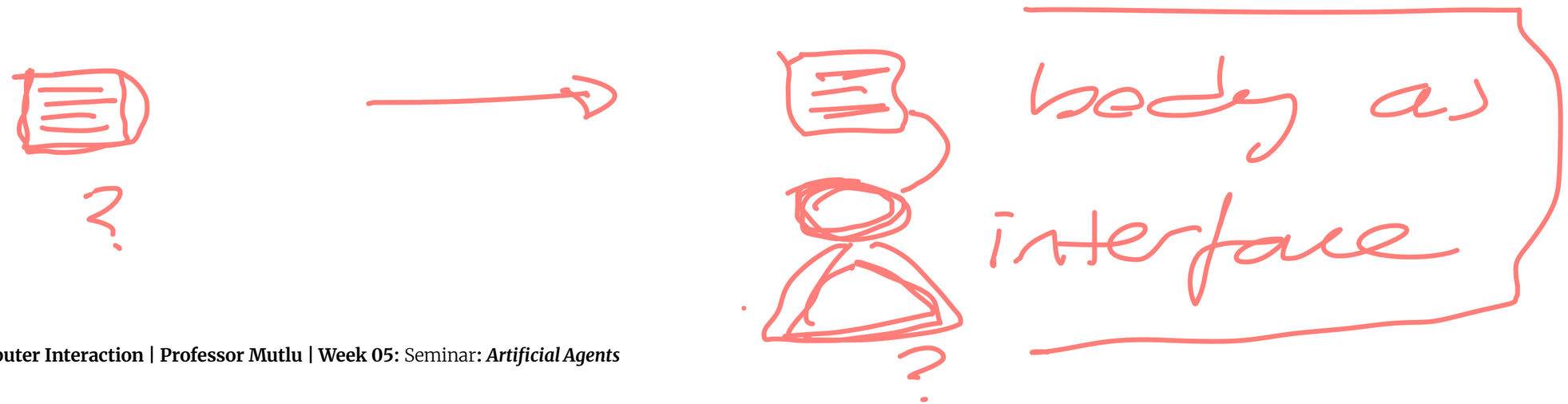


— **Cassell, 2001**[1]

[1] Cassell, 2001, Embodied conversational agents: representation and intelligence in user interfaces

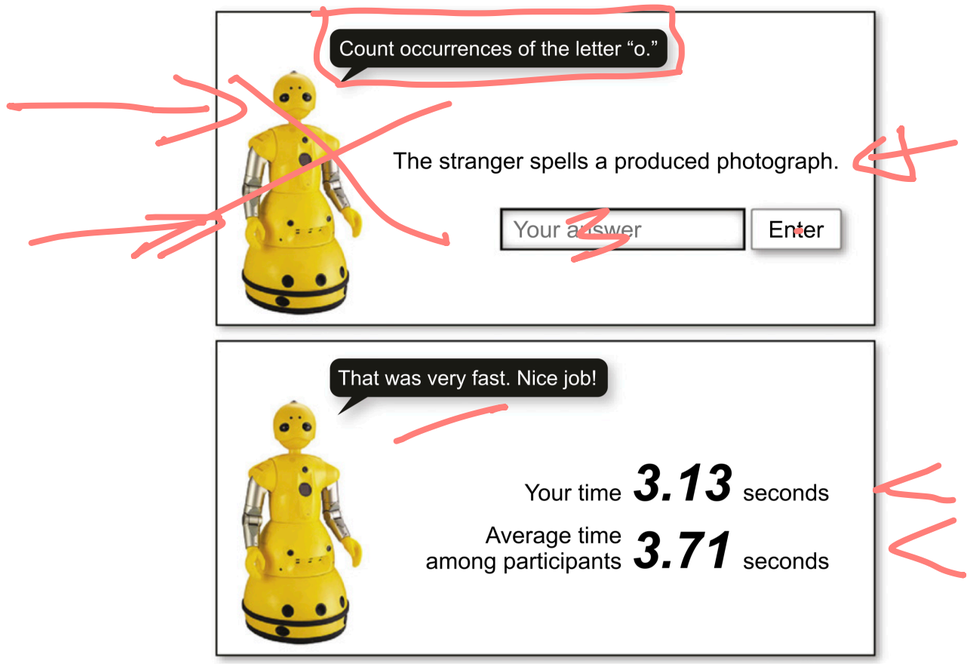
What does a body give us?

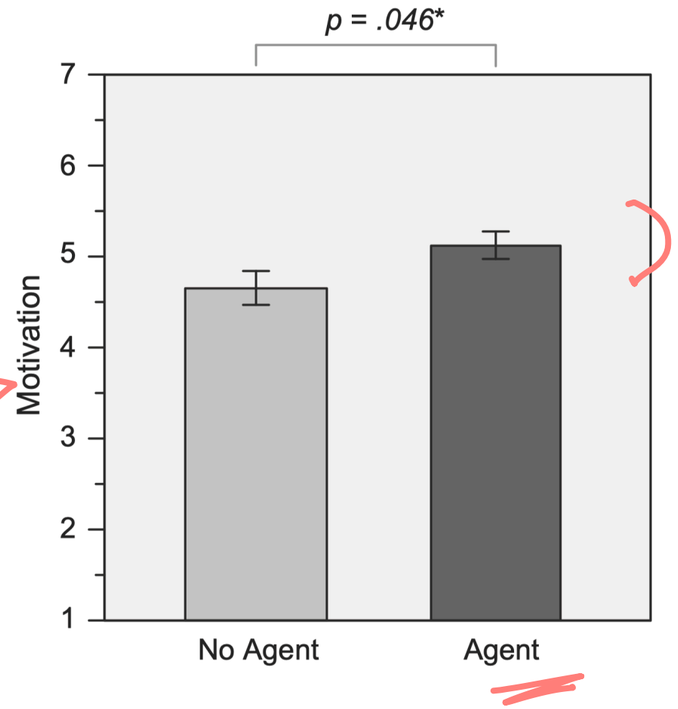
- A *locus of attention*—a target toward which we can our attention and behavior
- Cues about the agent's status (e.g., functioning, not broken, speaking, waiting)
- Opportunity to create plausible, coherent characters that signal the agent's role (e.g., a butler, a personal assistant, a collaborator)
- Ability to utilize social mechanisms in interaction design



Why do we need a locus of attention?

Increased presence of, arousal toward, and commitment to another entity with agency.[3]

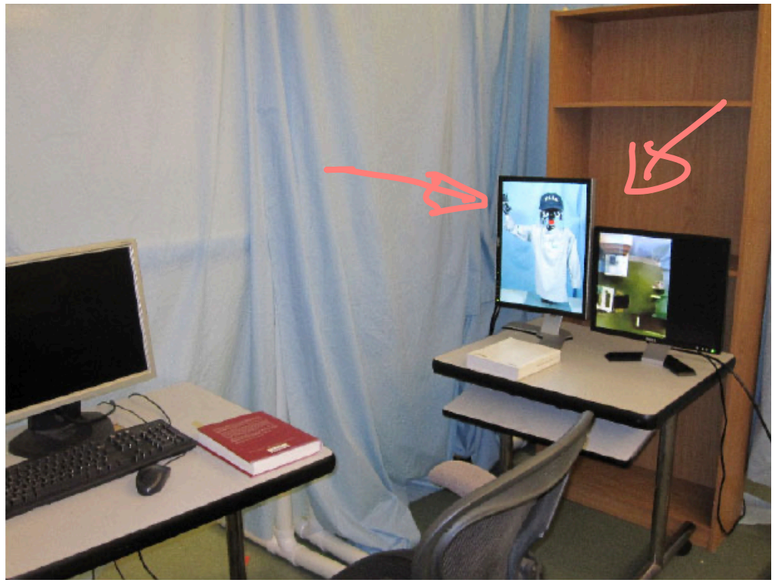


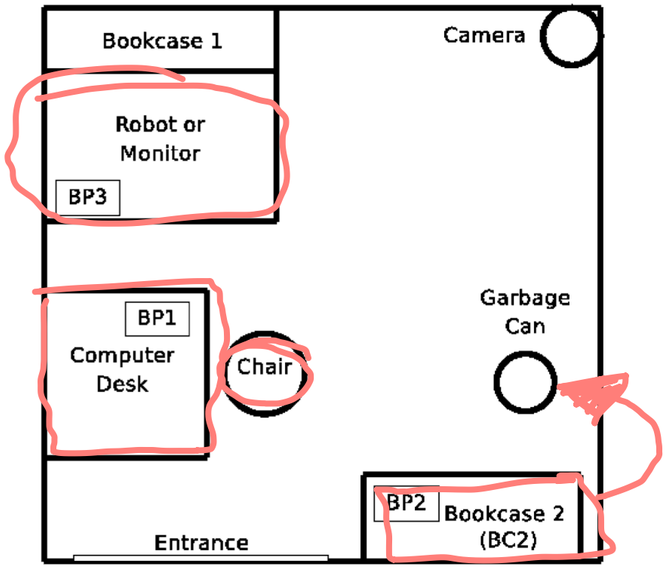


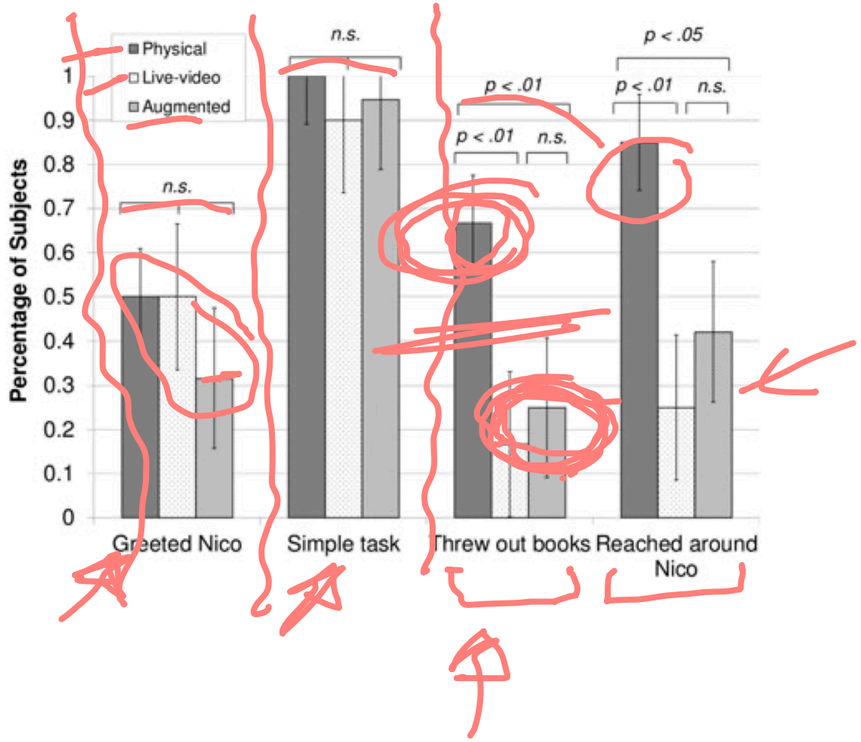
[3] Mumm & Mutlu, 2011, Designing motivational agents

Where should the body be?

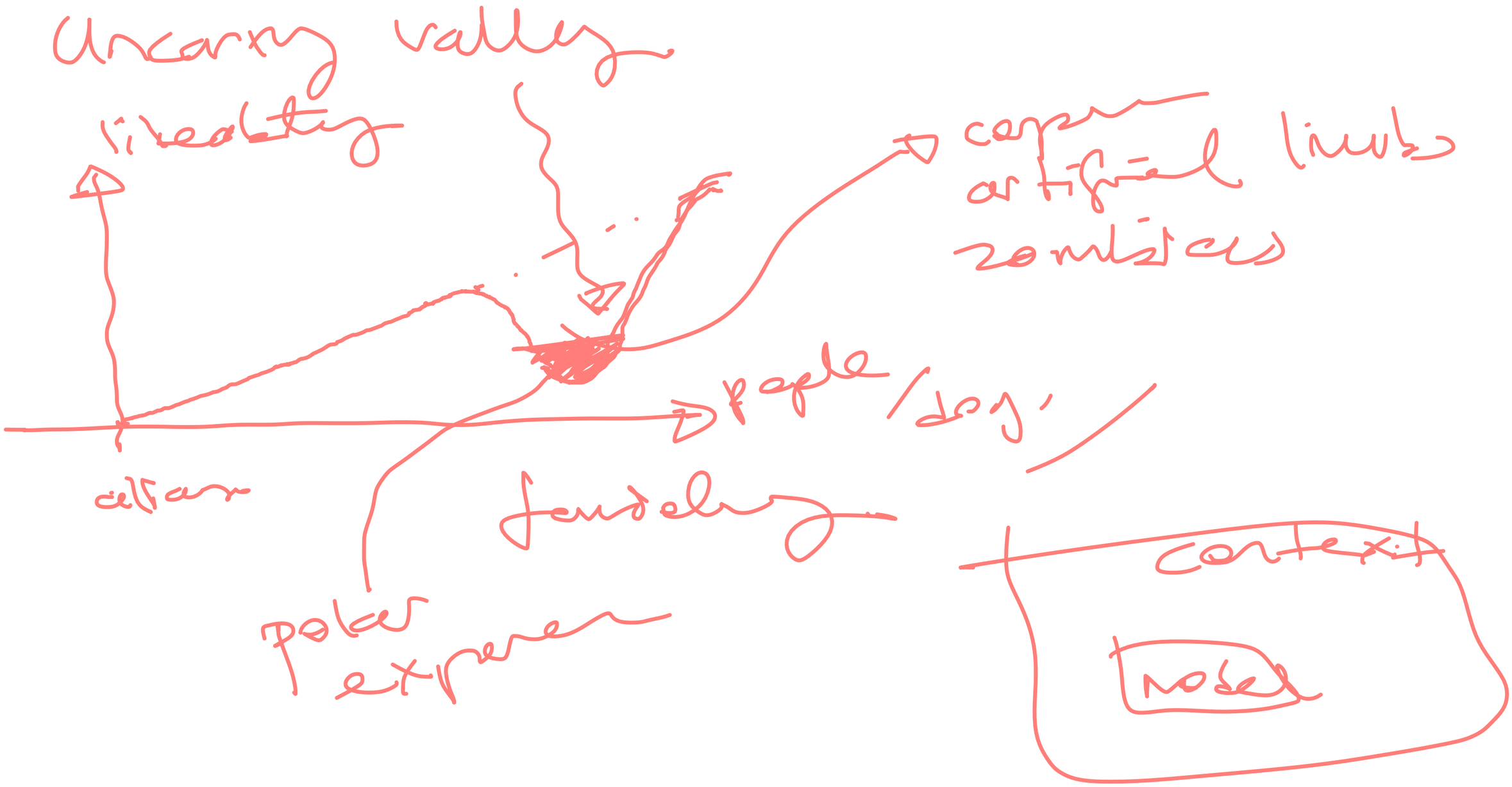
Physical bodies further improve social outcomes.[4]



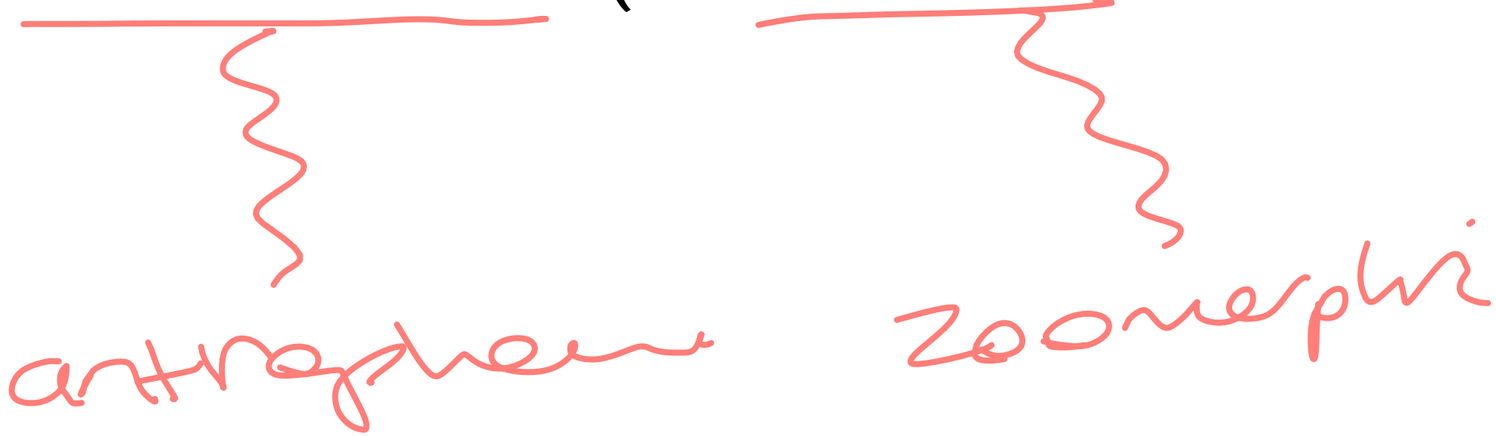




[4] Bainbridge et al, 2011, The benefits of interactions with physically present robots over video-displayed agents


Uncanny valley
likeability
corpse
artificial limbs
zombies
people/dog
allan
fantasy
polar
experience
context
model

Why do agents need human-like (or animal-like) bodies?

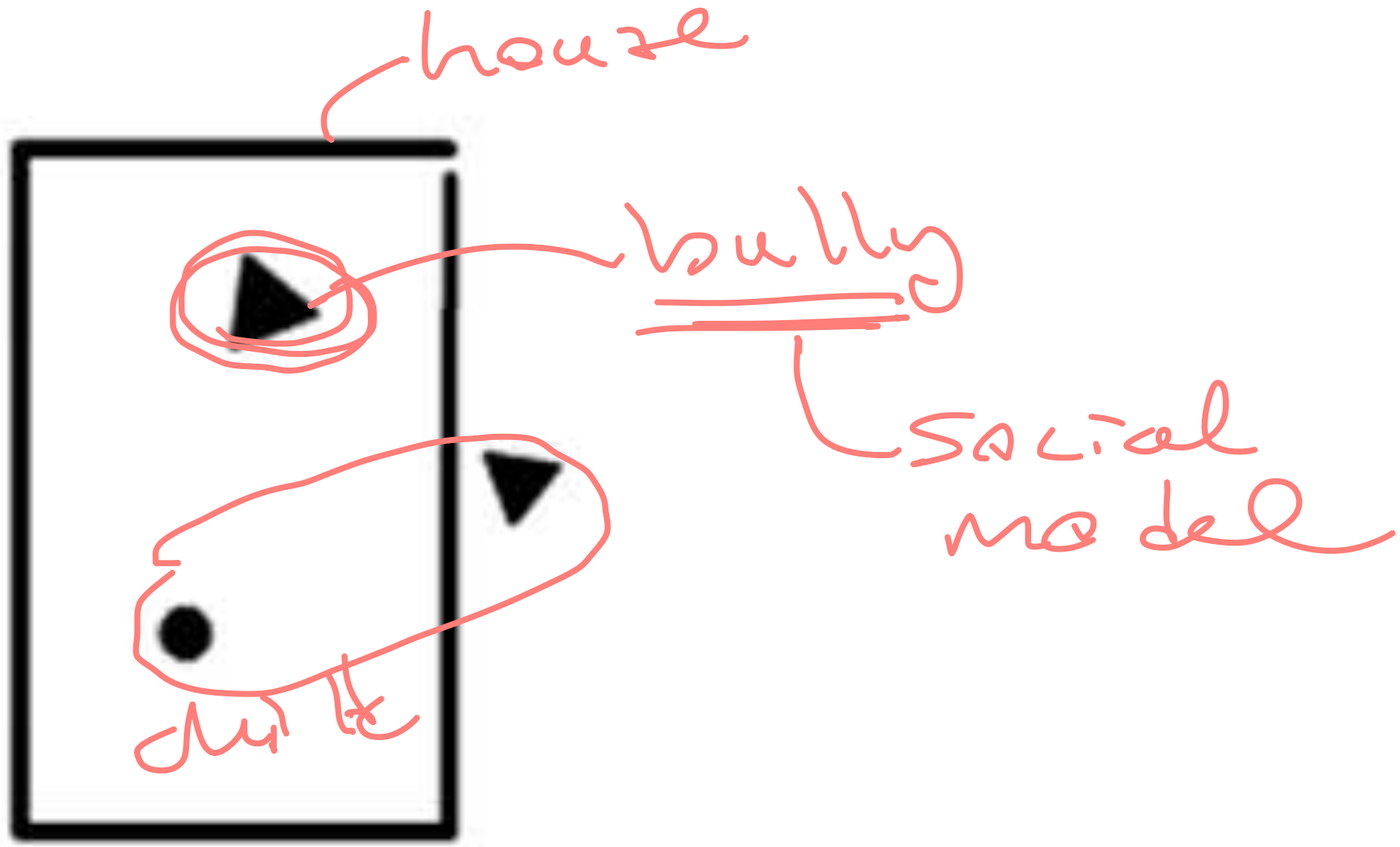


Faced with non-living things of sufficient complexity (i.e., when the observable behavior is not easily understood in terms of its underlying mechanisms), we often apply a social model to explain, understand, and predict their behavior.

— Breazeal, 2003[5]

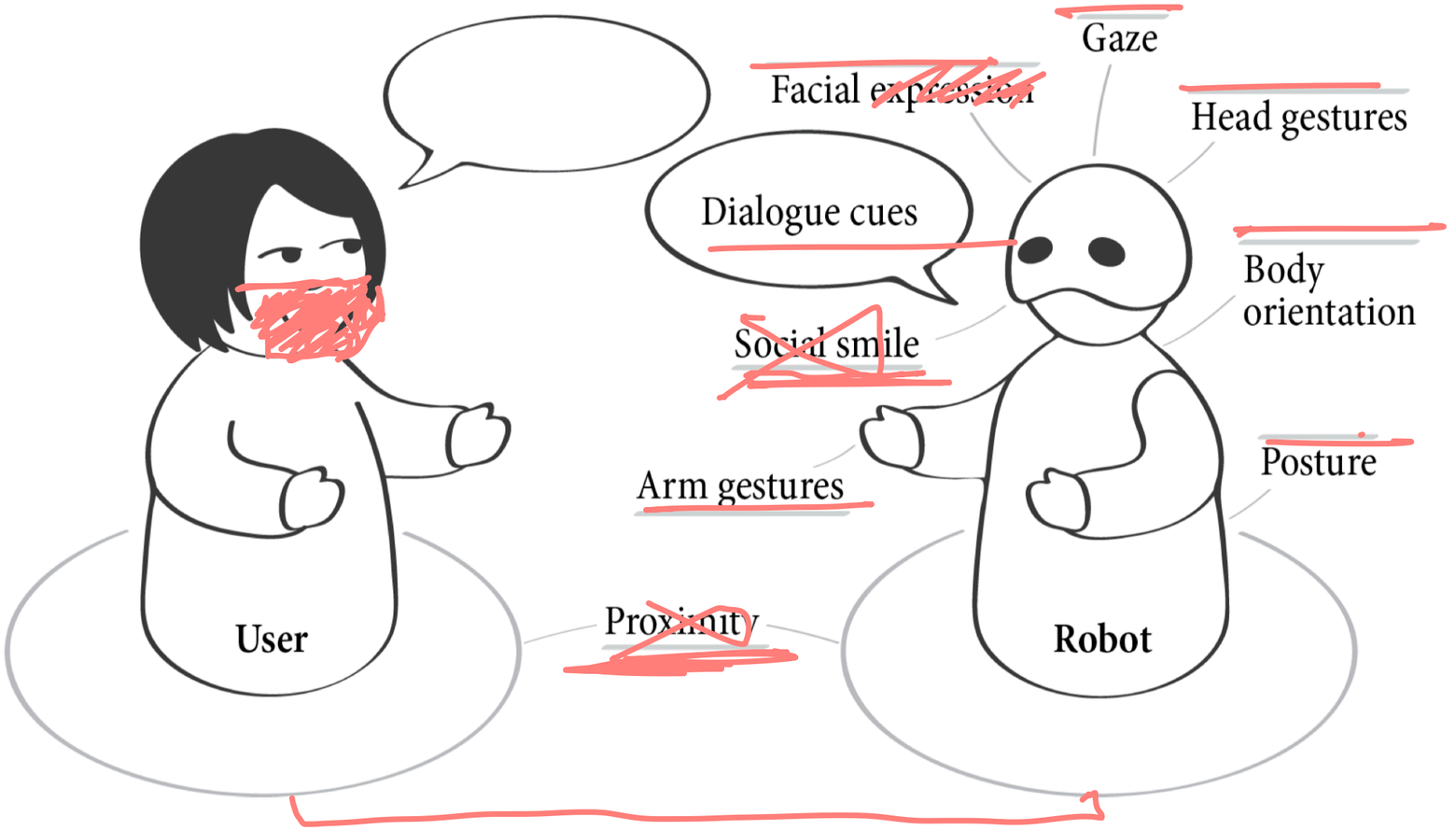
---

[5] Breazeal, C. (2003). Toward sociable robots. Robotics and autonomous systems, 42(3-4), 167-175.



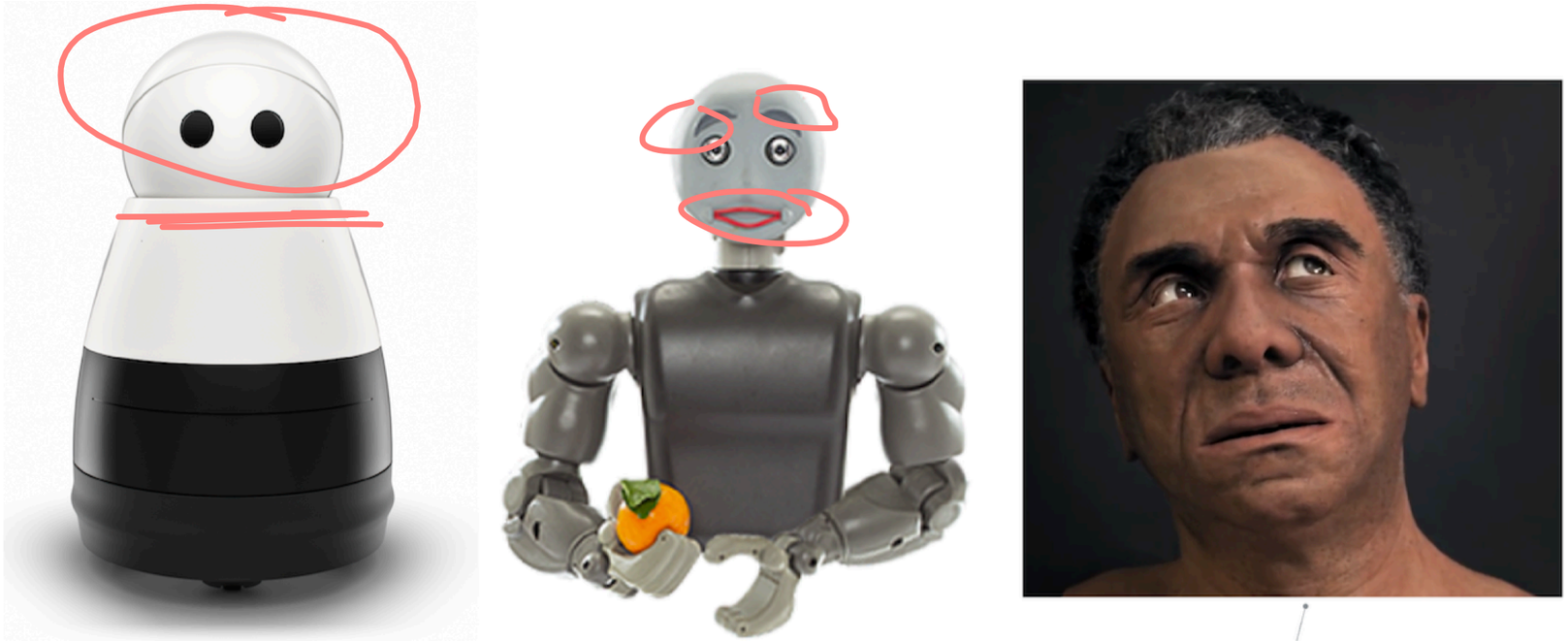
mmel, 1944, An experimental study of apparent behavior

How do we capitalize on social models?[8]



[8] Mutlu, 2011, Designing embodied cues for dialog with robots

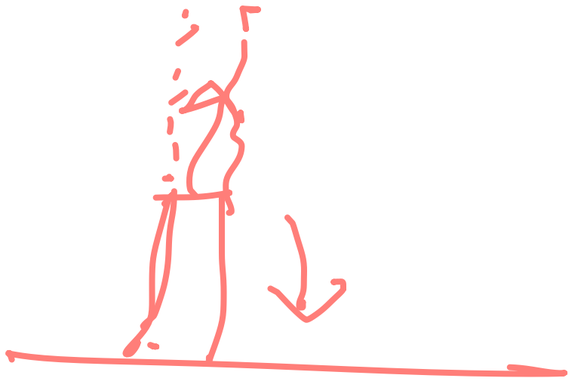
How do we design for social interaction?[9]



Human Design Metaphor

[9] Deng et al., 2019, Embodiment in socially interactive robots

Discussion Questions



- What are some of the agents you interact with day to day?
- What are your interactions like?
- What are advantages and disadvantages of agents with bodies?
- What are advantages and disadvantages of applying a social model?
- Interesting findings from your external source?
- ...