
INT D 554/PSYCO 457

Week 11: Humanoid Situation

Limitations Of The Sense-Act Cycle
Humanoid Situation = Humanoid
Intelligence?
Social Situation

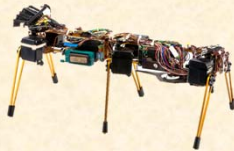
Situation

"The central idea that I've been playing with for the last 12-15 years is that's what we are and what biological systems are. It's not what's in the head, it's in their interaction with the world. You can't view it as the head, and the body hanging off the head, being directed by the brain, and the world being something else out there. It's a complete system, coupled together."



Insect Embodiment

Brooks' original robots were embodied as insects. In *Fast, Cheap, and Out of Control* he suggests that this was not intended



Limitations Of The Embodiment

- "It had to be admitted that behavior-based robots did not accomplish complex goals any more reliably than machines with more integrated controllers. Real insects illustrate the problem. The vast majority fail to complete their life cycles, often doomed, like moths trapped by a streetlight, by severe cognitive limitations. Only astronomical egg production ensures that enough offspring survive, by chance" (Moravec, 1999)



Hans Moravec
Carnegie Mellon University

New Embodiment

- One response to the criticism is to argue that the sense-act cycle is sufficiently powerful if appropriate senses/interactions are examined
- Thus, Brooks' group is now focusing on humanoid robotics



Humanoid intelligence requires humanoid interactions with the world.

MIT Perspective

- "Avoiding flighty anthropomorphism, you can consider Cog to be a set of sensors and actuators which tries to approximate the sensory and motor dynamics of a human body. Except for legs and a flexible spine, the major degrees of motor freedom in the trunk, head, and arms are all there. Sight exists, in the form of video cameras. Hearing and touch are on the drawing board. Proprioception in the form of joint position and torque is already in place; a vestibular system is on the way. Hands are being built as you read this, and a system for vocalization is also in the works."



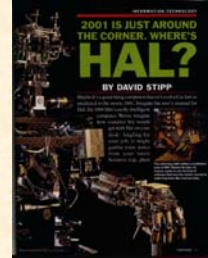
Overview of Cog

- This video provides a short overview of the Cog project at MIT
- <https://www.youtube.com/watch?v=CbZ9rUZZMA>
- Cog was retired in 2003



Implications and Issues

- In its day, Cog was the leading edge of the embodied movement
- It was one of the most famous robots in the world
- Does Cog's learning violate the subsumption architecture's assumptions?
- Can humanoid robots implement human intelligence?



New Directions

- Much more recently, Brooks and his company ReThink Robotics has explored humanoid robotics in more general and applied settings
- The result is [Sawyer](#)
- [Here is a video promoting Sawyer](#)



• Grounding Language In Vision

- More modern theories attempt to streamline language processing by situating it with vision
- One example is the cross-channel early lexical learning model (CELL)
- This model extracts phonetic features from recorded speech, and links these to the three-dimensional shape models derived from visual processing
- The goal is to ground semantics into situated visual entities – as demonstrated by [Toco the robot](#) in the video on the right



•Deb Roy



Developing Situation

- Toco has evolved into a newer robot platform called Ripley
- [Here is a short video demonstrating Ripley interacting with Nikolaos Mavridis](#)



Is Human Intelligence Required?

- Some would argue that humanoid embodiment is simply required as an interface, and that the goal of developing humanoid intelligence is not required
- [One example of this is Robotespian](#)



Philip K. Dick Android

- Hansen robotics has been criticized for following the approach of Robosapiens, but marketing their work as generating intelligent humanoid agents
- [One famous example of their work](#) is the Philip K. Dick Android



Sophia

- Hansen robotics had generated a lot of publicity lately with their most recent android, Sophia
- [Hansen robotics describes Sophia](#) as 'an evolving genius machine' and as a cultural icon



Criticisms of Sophia

- Many AI researchers and roboticists are very critical of Hansen robotics and their claims about Sophia
- [Facebook AI chief calls Sophia "complete bullshit"](#)



Towards Social Robotics

- Robots like Sophia do illustrate that robot embodiment may be crucial for supporting social interactions
- A great deal of research is using embodied cognitive science to explore a variety of issues concerning social interactions with humans

