EECy Interactions:

‘It’s the dance, stupid!’

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Trends in HTI

Current trends in HTI emphasize

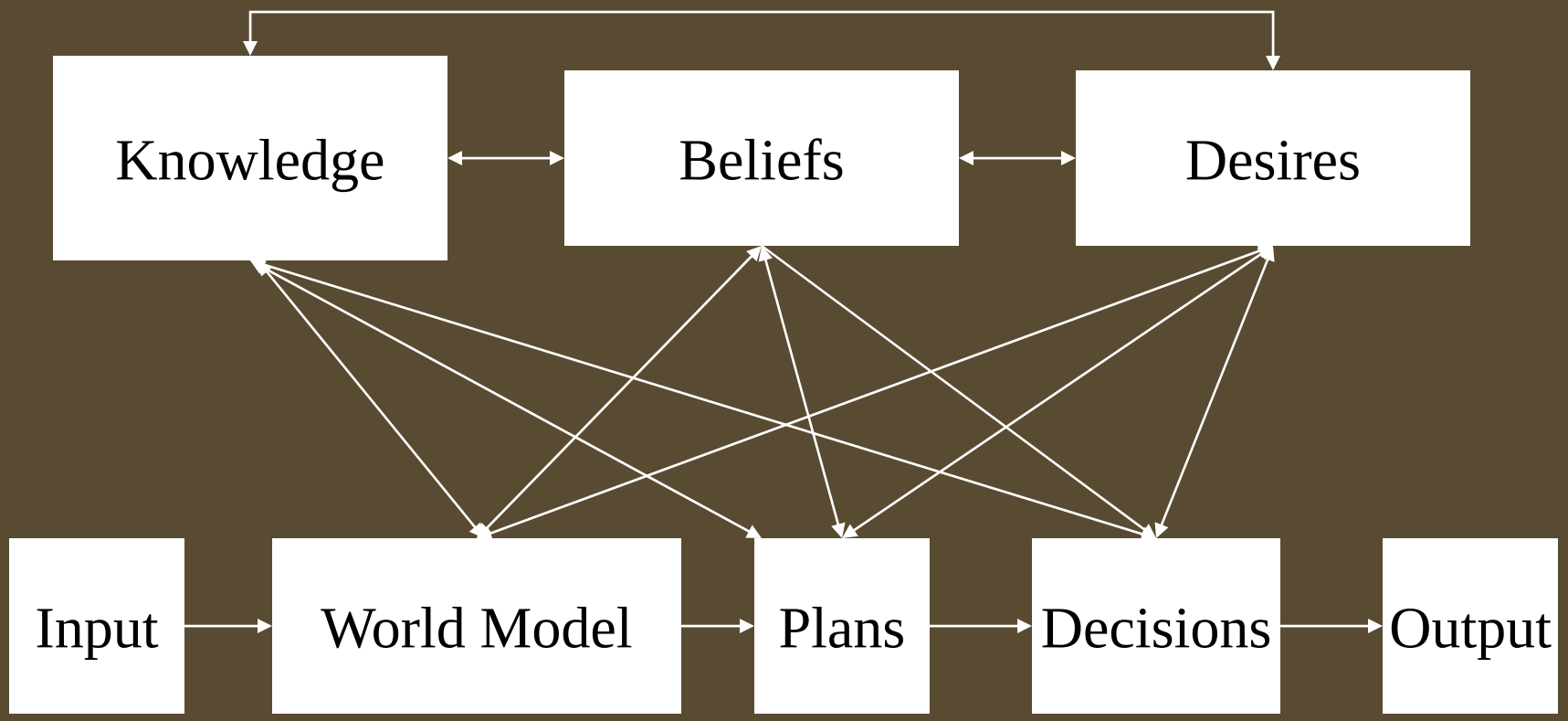
- Experience (UXD)
- Emotion (affective computing, emotional design)
- Social & identity values (e.g. personalisation)
- Bodily/spatial action (tangible interaction, wearables, augmented reality)
- Invisibility (ubiquitous computing, ambient computing)
- Or even direct access to the brain (brain computer interfacing)

- Does this mean 'cognition' is no longer relevant to interface design?
- No (we hold): cognition is of central importance to HCI design
- However: cognition 'is not what it used to be' > *embodied embedded cognition*

Theory

"Very impressive, my dear fellow, but does it also work in theory?"

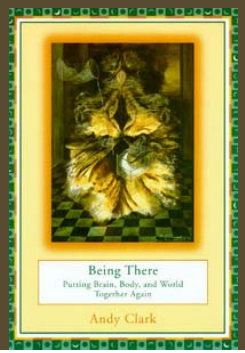
Cognition: A lot of thought?

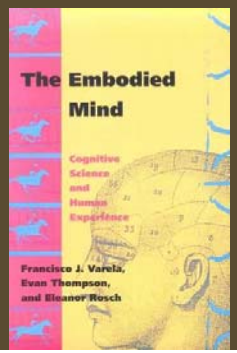


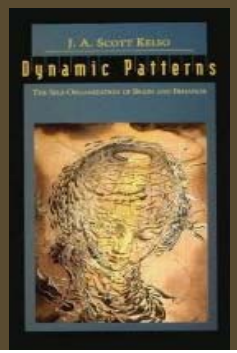
Embodied Embedded Cognition

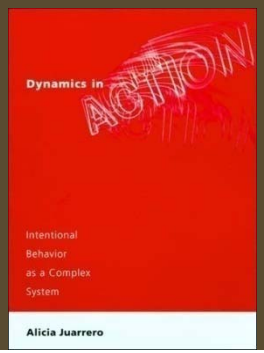
- Bodily interaction with the environment is primary, not secondary, to cognition
- Labels: enactive cognition, situated cognition, embedded cognition, extended cognition, etc.
- Some books:

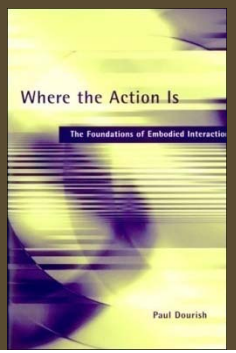
  Varela, Thompson & Rosch, 1991; Edelman, 1992; Thelen & Smith, 1994; Port & van Gelder, 1995; Kelso, 1995; Clancey, 1997; Agre, 1997; Clark, 1997, 2001; Juarerro, 1999; Keijzer, 2001; Dourish, 2001; and many others.





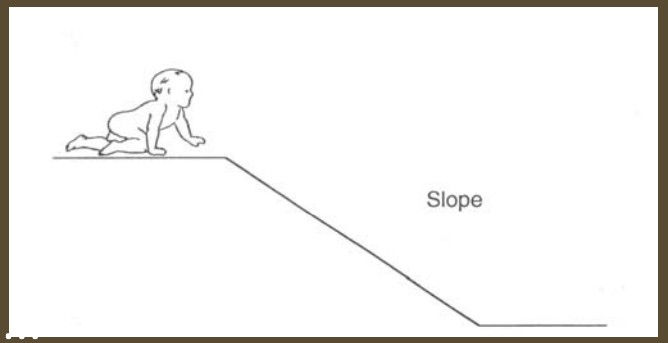






Embodiment

- **Intrinsic dynamics** (Kelso, 1995)
  - relatively autonomous coordination tendencies
- Learning to descend a slope (Adolph, 1993; Thelen & Smith, 1994)



- Learning to drive a car
- Playing football after many years.....
- Cognitive systems ‘tune into their bodies’
  - (Chiel & Beer, 1997)
  - phylogenetically
  - ontogenetically

Embeddedness

- **Scaffolding (Clark, 1997)**

  "We manage our physical and spatial surroundings in ways that fundamentally alter the information-processing tasks our brains confront." (Clark, 1997, p.63).

- **The 007 principle (Clark, 1997)**

  "In general, evolved creatures will neither store nor process information in costly ways when they can use the structure of the environment and their operations upon it as a convenient stand-in for the information-processing operations.

  That is, know only as much as you need to know to get the job done." (Clark, 1997, p.46).

- **Epistemic action** (Kirsh & Maglio, 1994)

Brooks' reactive robots

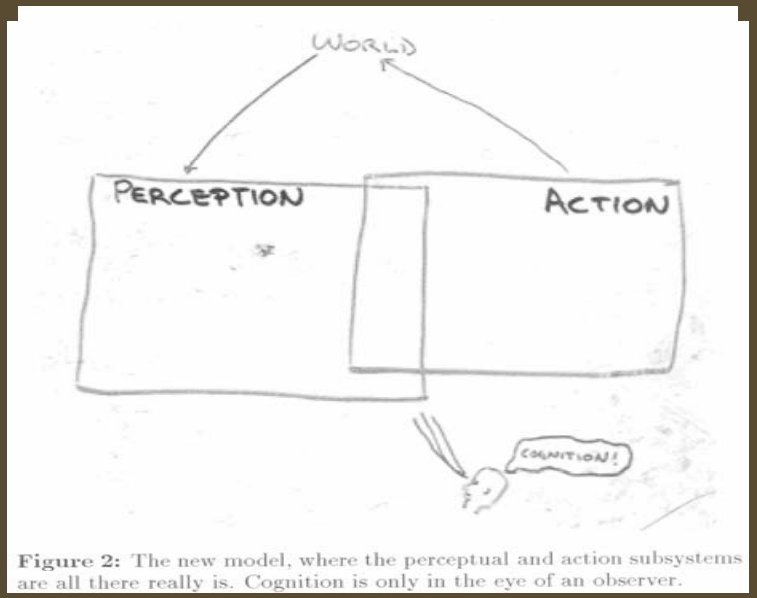
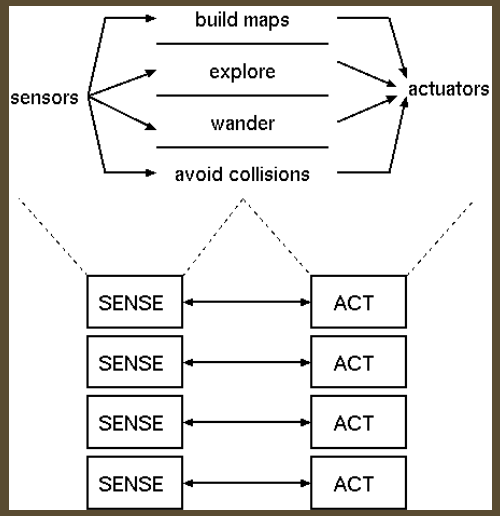


Figure 2: The new model, where the perceptual and action subsystems are all there really is. Cognition is only in the eye of an observer.

- Basic behaviors
  - interact through inhibition & suppression
- Overall behavior is emergent
  - **environment selects** from a behavioral repertoire
    - unprogrammed functionality
  - no center of intelligence but the behavior 'looks intelligent'



Reinterpreting the main task of the control system in common sense

- Not:

  focused on problem solving by means of integrated internal information processing, model building, planning and decision making

  ("flow chart of the Control Room")

- But:

  contributing to the ongoing interaction with the environment in a, when possible, basic perception-action cycle based way

- A different metaphor:

  The brain not as a conductor but merely one of several players in a jazz ensemble, aimed at improvisation (Chiel & Beer, 1997)

Auto-pilot & deep thought

- Many times we function on auto-pilot
  - Almost automatically, habitual, on-line
- Other times we operate on the basis of ‘deep thought’
  - Concentrated, conscious, off-line
- The majority of our daily life activities (‘getting by’) is based on this automatic pilot mode
  - Stop & think, switch to deep thought, return to auto-pilot
  - Following ‘laziness principles’

The laziness principles

Cognitive strategies for being lazy instead of tired

- Let the environment do the difficult work for you
  - scaffolding
- Don't think: Act!
  - just get started
    - the environment can correct you
    - it's often possible to adjust later on
- Copying and imitating are good
  - follow 'mam and dad'
- Postpone
  - don't think now of what you can think about later (something may happen in the meantime)
- Lower your ambitions
  - if the world doesn't cooperate: "Oh well, it's not all that important anyway"
- Seek company of people that agree with you
  - Call them 'friends'

Intermediate conclusions

- Embodied Embedded Cognition
  - Reinterprets the main tasks of our cognitive system
    - Contribute to the ongoing interaction with the environment (improvisation)
    - Prefer autopilot behavior over deep thought (laziness principles)
- Empirical issues
  - How much behavior can be modeled this way?
  - How to integrate deep thought with autopilot?

- What are the implications for HCI?

Practice

The EEC of everyday things…

Norman (1986 / new ed. 2002) already discussed design principles coherent with EEC:

Action-perception coupling:

- Affordances (product-form is action-affording)

Embodiment

- Use physical constraints

Embeddedness

- Use knowledge in the world (Clark's "extended mind")
- Simplify the task: (Clark's 'scaffolding', Kirsh's epistemic actions)

'Lazy brain':

- Visibility
- Design for error
- Natural mappings

Tangible interaction

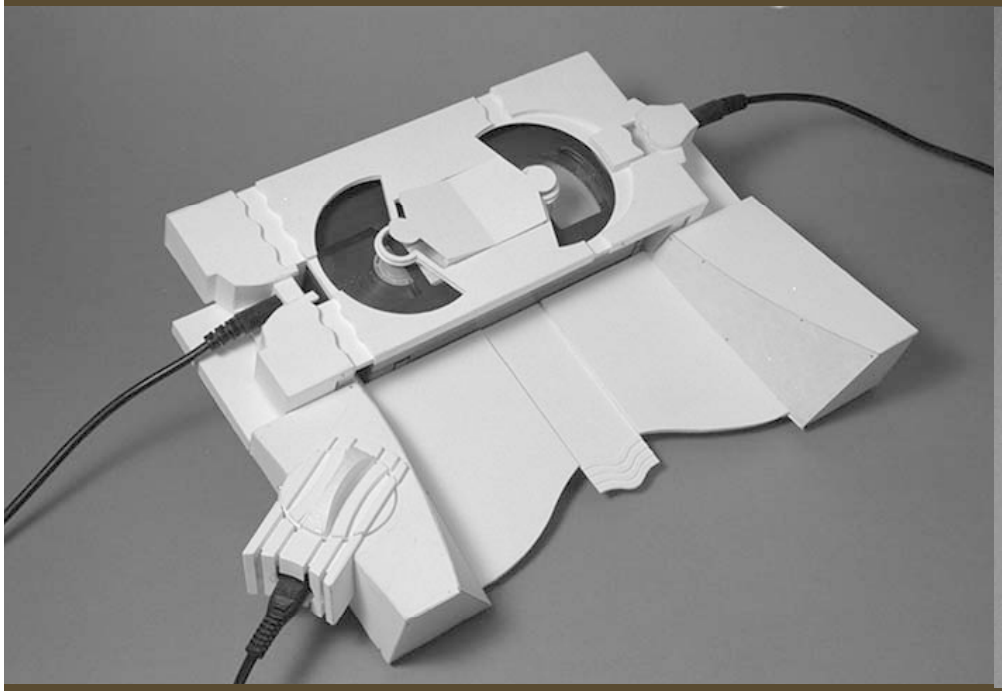
"Embodied interaction [is]... not simply ... a form of interaction that is embodied ... but rather that it is an approach tot the design and analysis of interaction that takes embodiment to be central to, even constitutive of, the whole phenomenon. *(Dourish, 2001, p102)"*

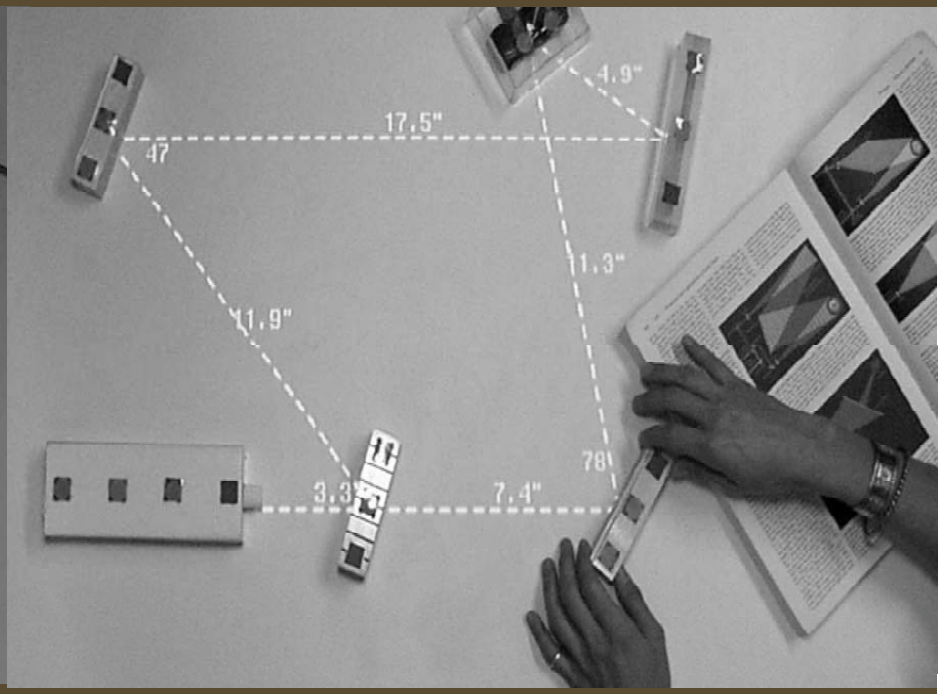
"Give physical form to digital information and computation … taking advantage of human abilities to grasp and manipulate physical objects and materials" (Ishii, 2007)"

"Solutions that carefully integrate the physical and digital worlds are likely to be more successful by admitting the improvisations of practice that the physical world offers" (Klemmer & Takayama, 2007)"

It’s the dance…

‘Scaffolding’ the lazy brain





It’s the dance…

From metaphoric message passing to facilitating embodied couplings

It’s the dance….

Make space for the user’s proces of ‘embedding’

The role of the designer

- How should we design for systems that facilitate 'embodied interaction' if EEC is highly:
  - Personal
  - Historical
  - Contextual
  - Dynamical
  - Emergent
  - Not easily modeled/formalised
  - And generally not '*the designer's*'?

Some suggestions

- “Interaction creates meaning’ does not only hold for users … but also for designers when generating ideas and developing concepts. … If one truly likes to design for movement-based interaction, one has to be or become an expert in movement, not just theoretically, by imagination or on paper, but by doing and experiencing while designing” (Hummels et al)

- “Perhaps the only way to create devices that connect to the user’s embodied cognition, is to let that same user become an integrated part of the design process. This, in effect, amounts to an argument for a (radical form of) participatory design” (Van Dijk et al)

- Other suggestions?

Conclusions

- Interaction is always physical/bodily interaction (too)
- It's the dance, stupid!

1. Support the lazy brain
2. Design for active, embodied exploration
3. Design for the user's oppertunities for 'embedding'
4. Revisit your role as designer

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