designing for physicality

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TouchIT


cognition connects with computation

when bodies touch technology

what is physical?

kinds of things
what do you think?
rules of the world

kinds of things

natural
• landscape
• objects: stones, sticks
• plants
• animals
• people
• air, water, and fire

artificial
• built environment
• tools
• mechanical
• electrical
• digital & computational
• language
• information

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properties of the physical world

physical
- dimensions
- tangible – feel it
- weight
- laws of physics
- one thing in one place
- social interactions
- no undo
- time

digital
- ????

what is physical?

kinds of things
what do you think?
rules of the world

three rules
to be broken

- directness of effort
- locality of effect
- visibility of state

continuity
in time and space

physicality and the body

bodily limitations
the adapted mind
action in the world
bodily limitations – skin and bone

- ergonomics and health
  - keyboards and trackpads
  - car switches

- as a design resource
  - simultaneous switches in nuclear bunker
  - sweets on the high shelf

bodily limitations – grey matter

- fleeting thoughts – electrical
  - Miller’s 7±2

- long-term memory – physical connections
  - some sums ...

- mood and medium term memory – chemical
  - coping with multiple chat windows

usability?

Some people say
a child should be able to use it

I always say
a caveman should be able to use it

physicality and the body

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evolutionary psychology

general principle …
  - major transition about 40,000 years ago
  - socio-linguistic eden
  - not evolutionarily adapted (significantly) since then
  - ‘neanderthals’ within the skull

more contentious
  - Cosmides, Toby, Pinker …
  - special purpose intelligences:
    - physical, animal, plant, social
  - hard-wired
    - swiss army knife model

special purpose intelligence

- rational
  - rule: vowel one side ⇒ even on other

- social
  - rule: take newspaper ⇒ pay for it
  
  [E 7 K 2]
  
  [paper £ no paper £]
cyborg driving

- understanding the extension of self

physicality and the body

- bodily limitations
- the adapted mind
- action in the world

action in the world

- Gibson and affordances
- distributed cognition
- the embodied mind

emulating the physical

- VR and second life

virtual physicality

- in the computer
- in our heads
making the digital appear physical

direct manipulation & desktop metaphor

virtual ‘space’
– work objects (files etc.) shown as buildings
– avatars where other people are working
– built over flexible event infrastructure

tower – workspace awareness

virtual physicality

in the computer
in our heads

brining together
the swiss army knife mind

• “The Prehistory of the Mind” (Mithen, 1996)
  – uses palaeontological record
• early animals and hominids
  – multiple intelligences there, but separate
  – intellectual development about linkage
• final link …
  – 40,000 years – multi-part tools, social, artistic
  – N.B. no physiological change
  socio-linguistic Eden

how linked?

• logic and rationality
  – transform everything to propositional form
  – talking to yourself!

• logic and rationality
• the real world
  – doing things makes the links
  – the world kicks back

c.f. …
distributed cognition
situated action
how linked?

- logic and rationality
- the real world
- imagination
  - just like really doing it
  - it kicks back too!

embodied computation

- always needs a physical substrate
- limits of physicality:
  - limited space => limited memory, limited computation
- the Turing machine is a touring machine

information and representation

physicality of digitality

computation & information
physicality and design

study the old to design the new

- look at ordinary consumer devices
  - washing machine, light switch, personal stereo
- why?
  - we are used to using them ourselves
  - they have been 'tested' by the marketplace
  - they embody the experience of designers

work with Masitah Ghazali & DEPtH project

using physicality

Drift Table (Gaver et al.)
weight drives movement

levels of fidelity in design

from paper prototype to working mock-up