getting physical

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an uncle from adelaide

shy the platypus

deep origins

• platypus – what is it?
  – bird, mammal, or reptile

• what about us
  – much shared
  – the animal within

rugby

... and a visit

hanging rock

red rock
usability?

Some people say a child should be able to use it
I say a caveman should be able to use it

special purpose intelligence

• rational
  - rule: vowel one side ⇒ even on other
    E 7 K 2
• social
  - rule: take newspaper ⇒ pay for it
    paper ⇔ no paper £ no £

coming together

• "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

how linked?

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

• 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!

... re-focus

- deep innate understanding
  - deals with the mundane
  - inflexible or slow to adapt
  - little attention (some at motor level)
  - fast
- rich conscious intelligence
  - effective for the complex
  - adaptable to the novel
  - needs attention
  - slow

the physical world

- we live in it
- we are good at it!
- we understand it

properties of physicality

- directness of effect
  - push and it moves
- locality of effect
  - here and now
- visibility of state
  - small number of relevant parameters

the physical world

- we live in it
- we are good at it!
- we understand it

- so harness it ...
  - direct manipulation
  - virtual and augmented reality
  - some ubiquitous computing
  - tangible interfaces
  - ordinary controls: knobs and switches

study the old to design the new

- work with Masitah Ghazali
- 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
half empty?

- not the first ...
  - Norman – DOET/POET
  - Thimbleby – FSM for video, microwave
- often used as HCI strawman
  - emphasise for design flaws
- we are looking for the good lessons
  - how mundane devices exploit physicality

models of AR & tangibility

- Ullmer and Ishii – MCRpd
  - architectural interaction model
- Benford et al. – sensible/sensable/desirable
  - exploring design space
- Koleva et al. – TUI framework
  - ‘coherence’ between the physical and digital

physical-logical connections

- Ullmer and Ishii – architectural interaction model
- Benford et al. – sensible/sensable/desirable
- Koleva et al. – TUI framework

- ‘naturalness’ of device–logical mapping

fluidity

device & logical states

- several visible states of device
- one-to-one mapping to logical state
- separate issue: is mapping clear?

exposed state
hidden state

- when no exposed state
- may rely on semantic feedback
- poor 'fixes' ... LEDs, separate display
- but sometimes necessary: too many logical states, variable number of logical states, limited space
- transitions become more important: natural felt bumps ... haptic feedback

inverse actions

+ speaker dial – exploits natural physical inverse actions: turn clockwise
+ especially important if the user does not have a perfect knowledge of the physical-logical mapping: unknown or mode-dependent
+ semantic feedback essential
+ issues: delays, obvious inverse?

spring-back controls

series of spring-back controls each cycle through some options
- natural inverse back/forward
build for track movement pull and twist for volume
- natural inverse for twist

compliant interaction

+ rotary knob exhibits symmetry of machine–system interaction
+ user sets the program by turning the dial ... system also turns the dial itself as the program advances
+ expert users learn to fine tune the device: skip programmes etc.

so what ... tangible interfaces

- apply to novel devices
  - with Masitah & Jennifer Sheridan
    - looking at cubicles (Gerd Kortuem)
    - e.g. how many states
  - link to Koleva et al.’s TUI framework
    - e.g. configurability & natural inverse

so what ... methodology

- ubicomp, tangibles
  - try to be useful ...
  - but rarely deployed
- mundane devices
  - already used
- artistic contexts ...
  - doesn’t need to be useful
  - can be playful