what is formal?

finger counting to abstract concepts

what is formal?

• dinner jacket and bow tie?
  – outward appearance of things – the form

• in maths and computing ...
  – representations (diagrams, formulae, etc.)
    • analysed and manipulated separate from meaning
  – how?
    • faithfully encapsulate significant aspects of meaning
counting cockroaches - first night

213

counting cockroaches - second night

279
which night had more?

- second night: 279 > 213

- how can you be certain?
  - count faithfully represents significant feature

- but not everything ...
  - cockroaches on first night may be:
    - bigger, different colour, more friendly

representing things absent

- symbols, icons, words
  - stand for things not present

- simulated screen shots
  - represent the unrealised designs
    (N.B. no dynamics – limited meaning)

- counting cockroaches
  - keep in a jam jar? disrupts the world
  - numbers make the impossible possible
placeholders

- homunculus – any person
  - not just someone, anyone

- maths: $\forall n: n+1 > n$
  - saying an infinite amount

- counting: 279 > 213
  - cockroaches, apples, llamas

abstraction

- increasing abstraction
  - screenshot – one screen
  - storyboard – single sequence of interaction
  - navigation diagram – potential paths

- and further ...
  - work on UNDO
  - any system with particular properties ...
forcing you to think

when you count cockroaches you have to decide what counts as a cockroach

baby or adult

live or dead

the myth of informality

• spiritus mundi
  – formality, precision
    = reductionism, positivism = BAD

• focus (rightly) on
  – context, situatedness, contingency

• BOTH needed
  – the world is rich and complex
  – but computers are formal (as is language)
  – key is choosing the right abstractions
  – and knowing what is left out
early examples

formalism in action

digital watch - user instructions

- two main modes
- limited interface - 3 buttons
- button A changes mode
- state transition network (STN)

- Time display
  - Depress button A for 2 seconds

- Stop watch
  - Depress button A for 2 seconds

- Time setting
  - Button A

- Alarm setting
  - Button A
example - nuclear control

- what happens if we press '+' in red mode?

N.B. question from form only

digital watch - user instructions

"depress button A for 2 seconds"

so ...

- time important
- distinguish depress A and release A
designer’s instructions

and ...

that’s just one button

lessons

• formal analysis
  – ask questions based on form of diagrams

• early analysis
  – catch problems even before prototyping

• lack of bias
  – usually test what we expect, analysis breaks this

• alternative perspective
  – different representations show different things

• forcing design decisions
  – did watch designer make these decisions or programmer?