Entering numbers: the computer science of the everyday

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Aims

▪ Computer Science of Everyday Things
  – Number entry
  – Regular expressions
  – Human-computer interaction
▪ A taste of things to come
Number entry
To err is human…

- Very common device in NHS
- Nurse entered 68 not 6.8
- Patient died next day
- What actually happened?
But it’s very rare, isn’t it?

- People make mistakes
  - 10% of all admissions
  - 10% of those are potentially fatal
  - 40,000 per year in the US
- Human error or poor design?
Thinking about numbers

- Think up 5 different numbers that plausibly you might enter into a syringe pump?
  - Concentrations
  - Volumes
  - Times
  - Rates

- Explore the possibilities
ISMP Guidelines

- No trailing zeros (5 mg, never 5.0 mg)
- Use leading zeros for doses less than one measurement unit (0.3 mg, never .3 mg)
- Units
- Font: 0•35
Regular expressions

- Shorthand
- Describe “strings” of characters
- Three operations:
  - Sequence
  - Iteration, *
  - Optionality, |
Examples

- Let = “A” | … | “Z”
- Num = “0” | … | “9”
- Let Let Num Num Let Let Let Let
- “Y” Num*
Exercise

- Can you come up with a regular expression for ISMP compatible numbers?
RE and Syringe Pumps

- Use RE to block invalid numbers
- Exhaustive simulation of errors
  - Java, Mathematica
- Halve the out-by-10 errors
RE and Syringe Pumps

- Use RE to block invalid numbers
- Exhaustive simulation of errors
  - Java, Mathematica
- Halve the out-by-10 errors
- But we had to guess some bits
Computer Science could help…

- Device logs
- Regular expressions
- Simulations
- Interface design
Where to find out more

- http://www.cs.swan.ac.uk/~csharold/
- Norman, *Design of Everyday Things*
- Here