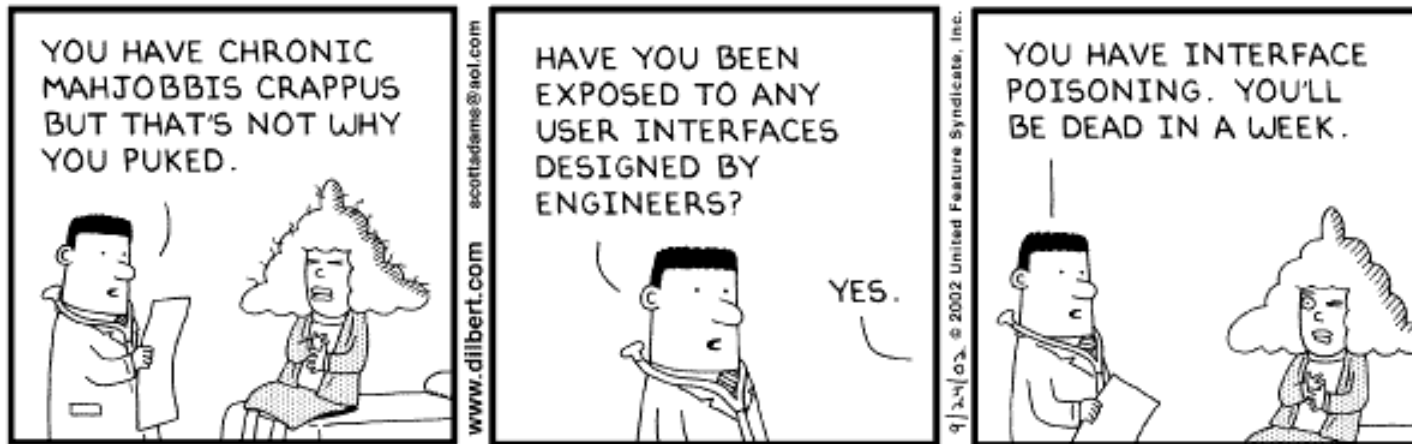


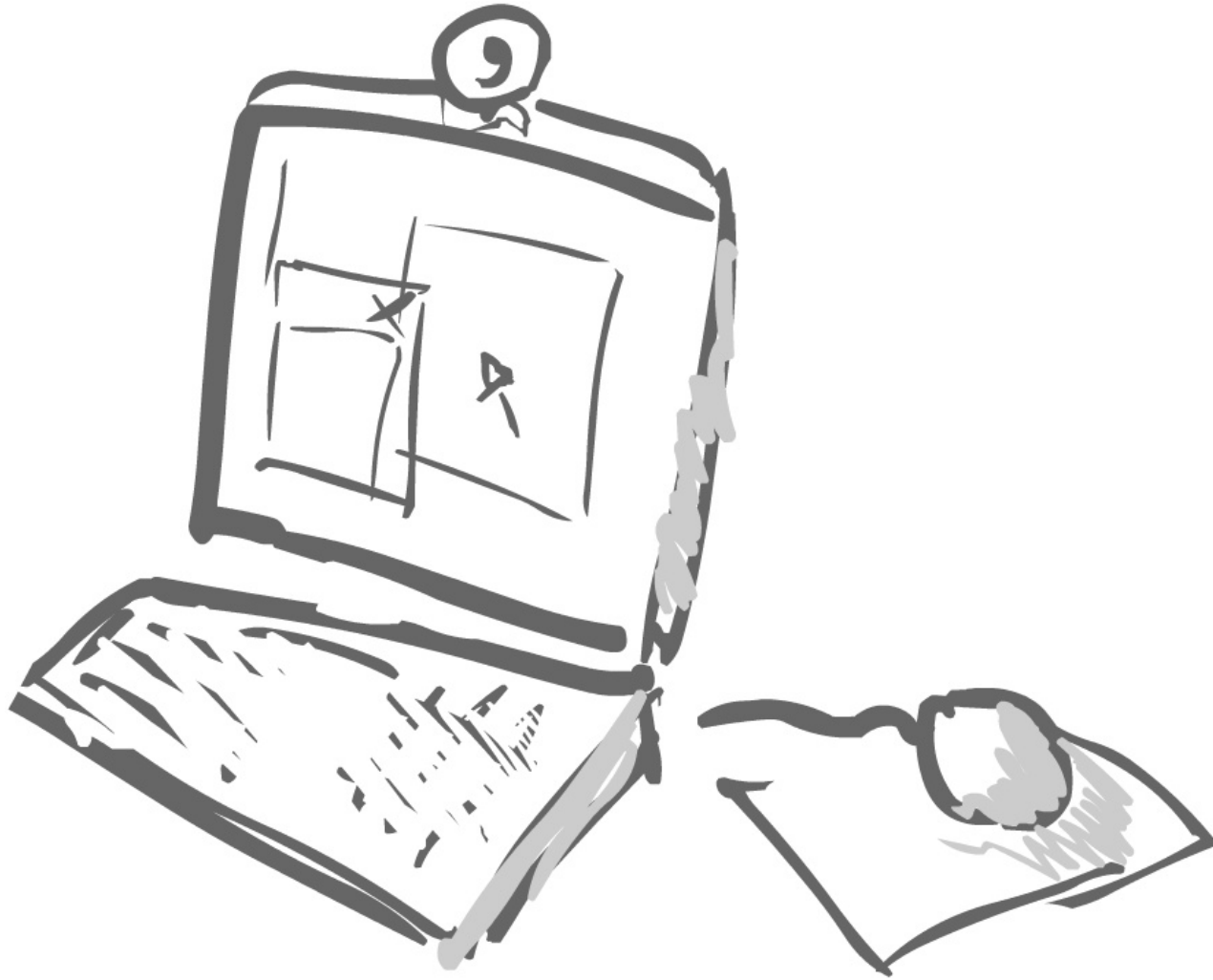
Questions?

- Project #1
 - Registered?
 - Users interviews?
 - Rapid prototyping?
- Grad project



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Computer today



Input devices I



Logitech mouse
IBM Trackpoint



Wacom



Wacom tablet



PlayStation 2

Voice



Microsoft keyboard

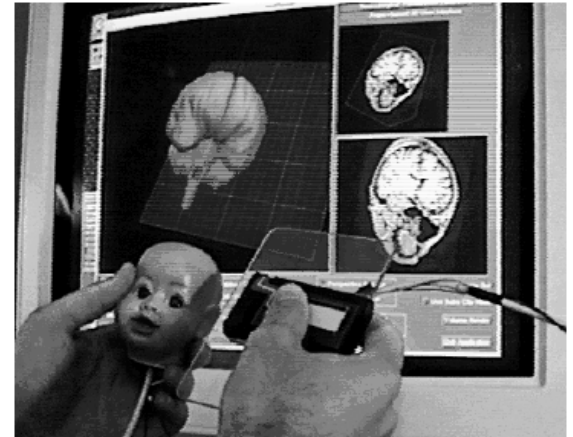
Input devices II



SpaceBall (6DOF)



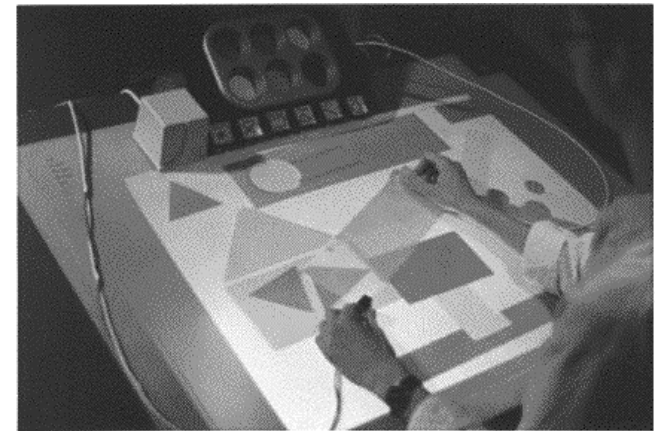
Phantom



Ken Hinckley



Anoto pen

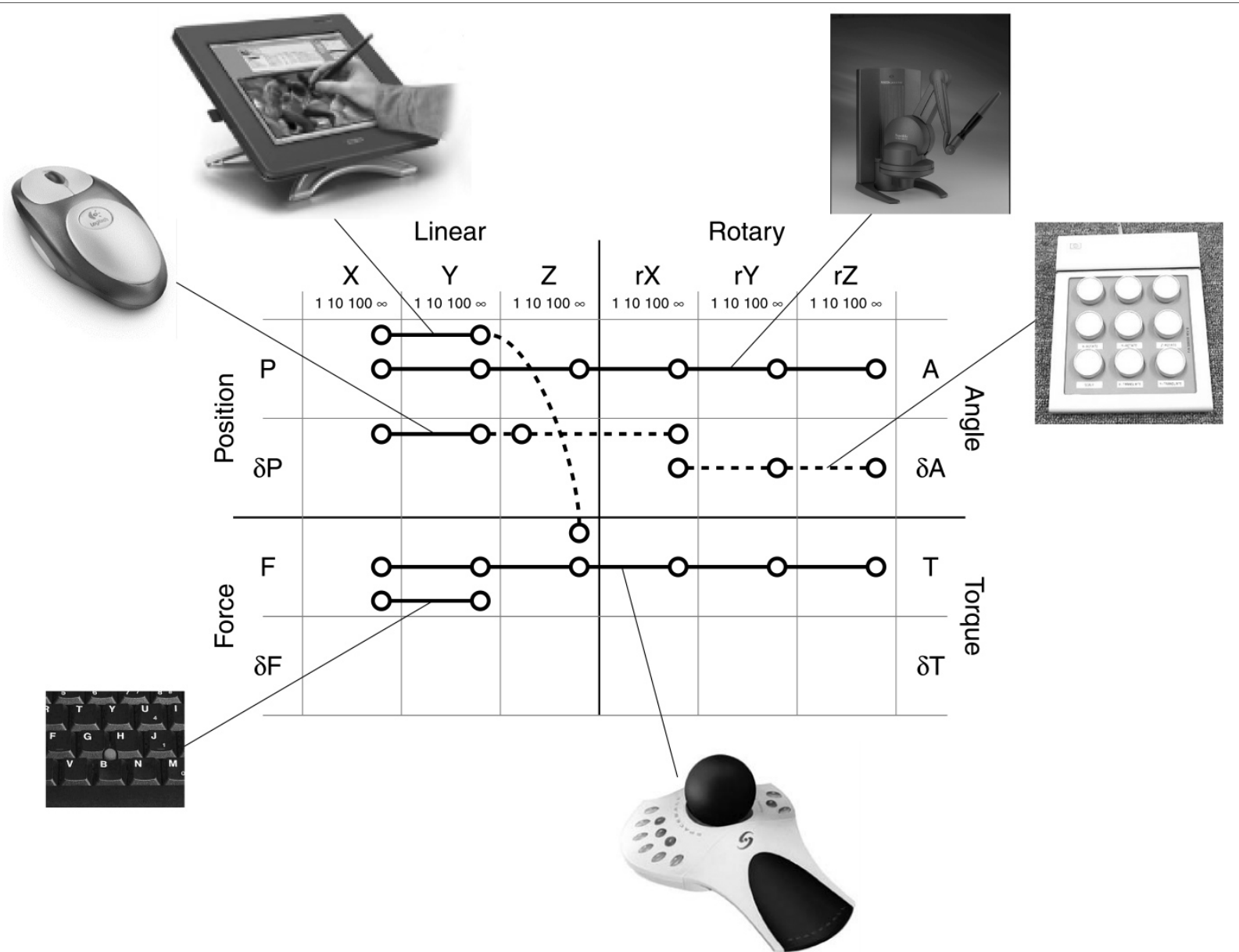


George Fitzmaurice

Input devices characteristics

- Degrees of Freedom
 - Rotary knob: (1 DOF), Mouse (2 DOF)...
 - SpaceBall (6 DOF), 2 Handed Polhemus (12 DOF)
- Isometric or Isotonic
 - TrackPoint versus mouse
- Relative or absolute
 - Mouse versus a pen on the screen
- Direct or indirect
 - Working on your desk versus working on the screen
- Linear or rotary
 - Knob versus a slider

Design space of input devices [Card et al.]



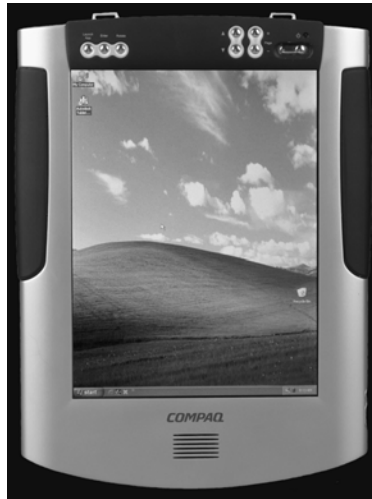
Some Insights

- Isometric or Isotonic
 - Isotonic best for position
 - Isometric best for rate control
 - *Good driver difficult to implement*
- Relative or absolute
 - Relative saves space
 - Absolute faster
- Direct or indirect
 - Direct is faster
 - Indirect maybe more ergonomic

Output devices I



Wacom



Printer



Stanford interactive Mural



IBM (9 Mpixel)

Output devices II



Phantom

VirTouch



Olympus Eye-Trek

Speech

(Mark Weiser)

- *Scrap computers*

[illegible]

The invisible computer (Norman)

The computer for the 21st Century

(Mark Weiser)

- Key breakthroughs
 - Network technology
 - *High connectivity*
 - *High mobility*
 - *Good bandwidth*
 - Storage
 - *No need for delete*
 - Context aware
 - *Not AI*
 - *Privacy?*
 - Collaboration aware
 - *Easy to collaborate with them*
 - *Substrate for interactions*
 - Moving information around between appliance