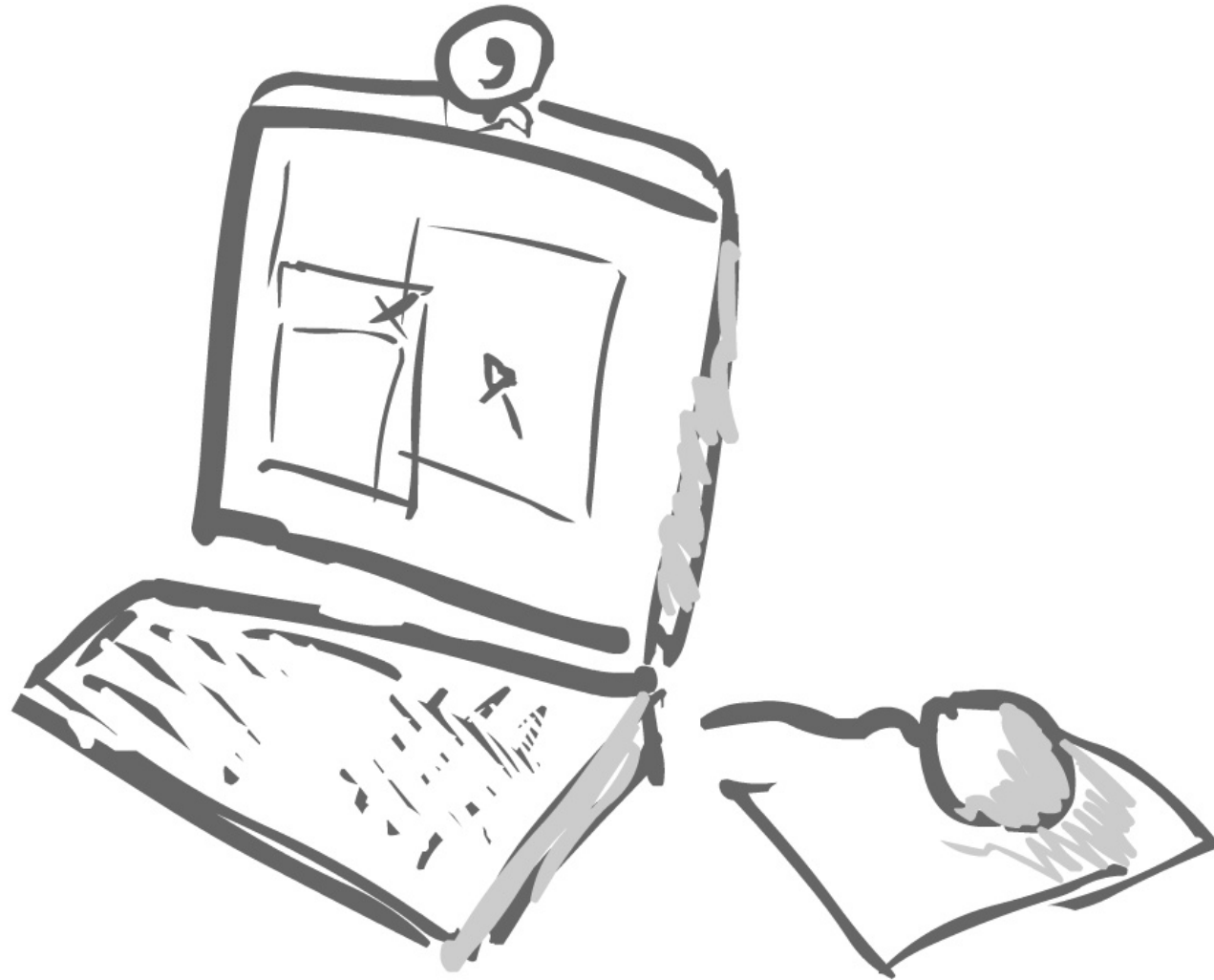


Questions?

- Project #3
- Homework #5 is due today
- Homework #6 is out today
- Midterm in a week and a half
- Flash refresher this Friday

Computer today



Input devices I



Logitech mouse
IBM Trackpoint



Wacom



Wacom tablet



PlayStation 2

Voice



Microsoft keyboard

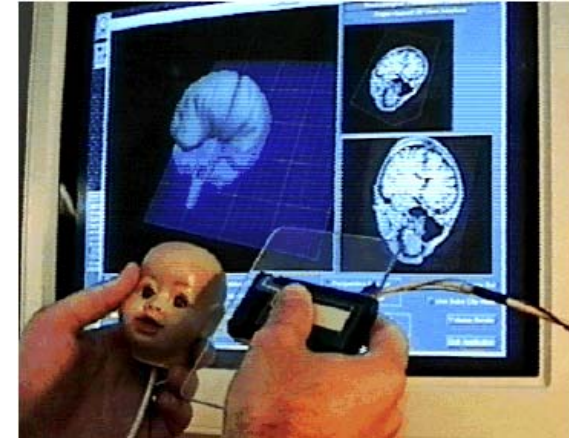
Input devices II



SpaceBall (6DOF)



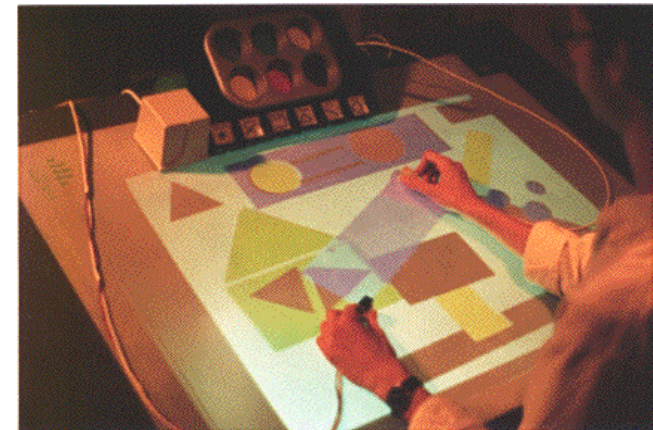
Phantom



Ken Hinckley



Anoto pen

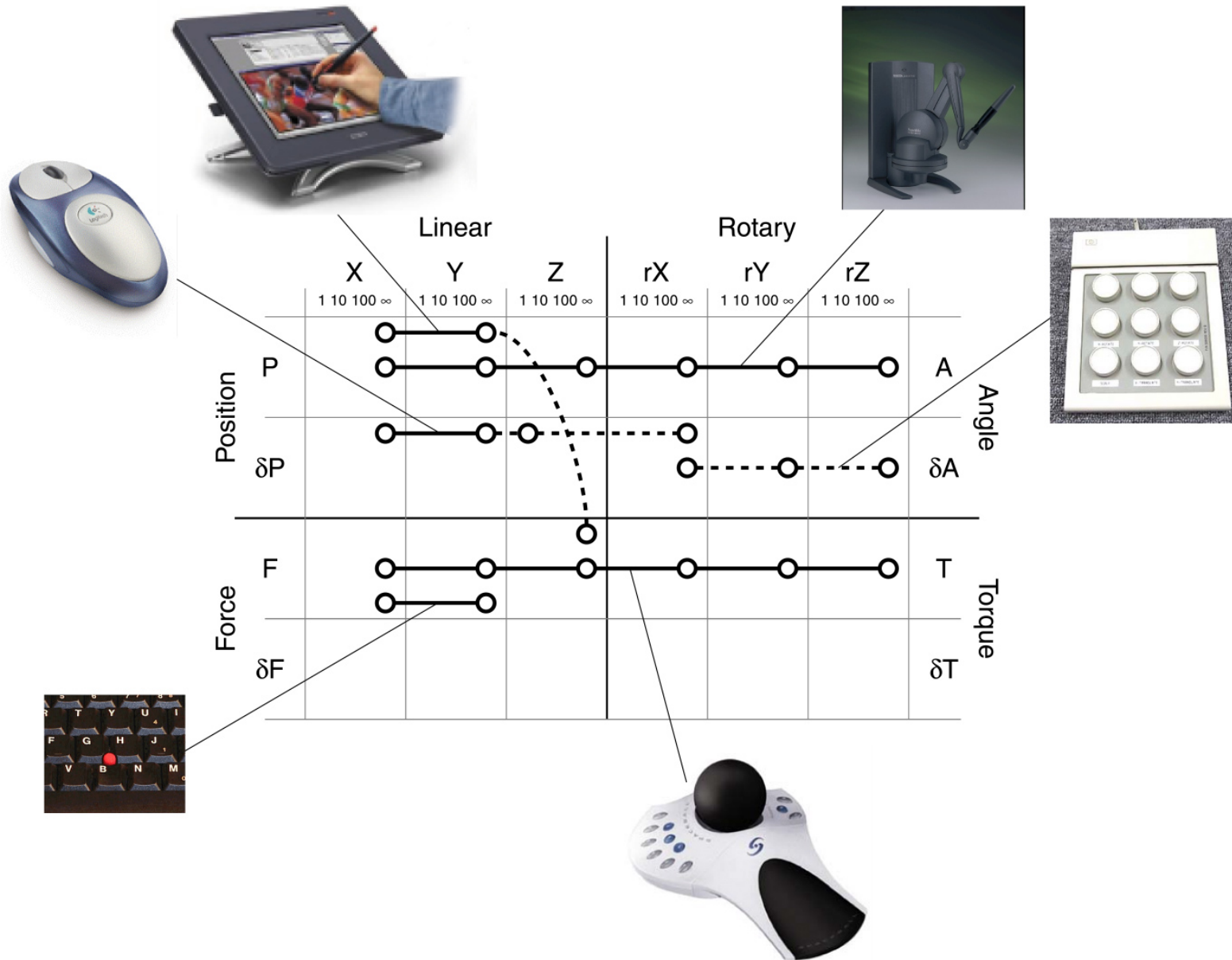


George Fitzmaurice

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 characteristics

- Modality
 - Sight, hearing, touch, taste and smell
- Dynamic or static
 - Computer display versus printer
- Resolution and size
 - From cell phone display to mural size
- How faithful to our everyday experience
 - From grey scale printed image to full color stereoscopic display

Output devices I



Wacom



Printer



Stanford interactive Mural

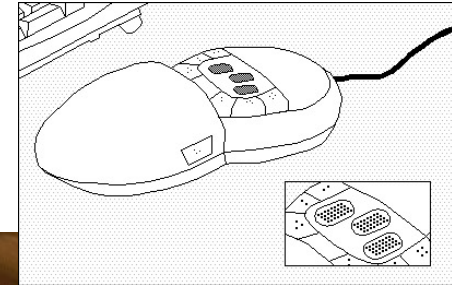


IBM (9 Mpixel)

Output devices II



Phantom



VirTouch



Olympus Eye-Trek

Speech

How to select a movie?

- Picking from a list
- Text entry
 - Keyboards
 - *Standard*,
 - *Miniatures*
 - Phones, Blackberry
 - *Virtual on screen*
 - Touch based, game like (selecting each letter with a joystick)
 - Gesture based
 - *UniStroke* [Goldberg 93] *and Graffiti*
 - *QuikWrite* [Perlin 98] *and T-Cube* [Venolia 94]
 - *Dasher* [Ward 2000]
 - *Handwriting recognition*
 - Smart completion and advanced search engines
 - *Google...*

Keyboards



Office keyboard



Cell phone

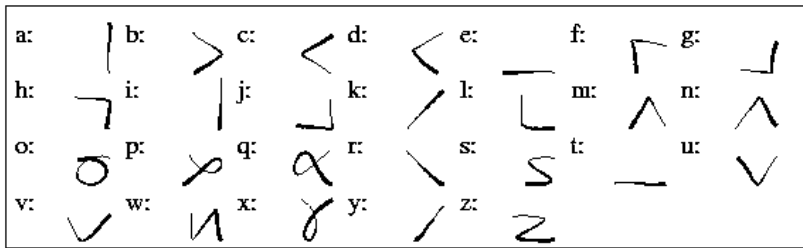


Blackberry

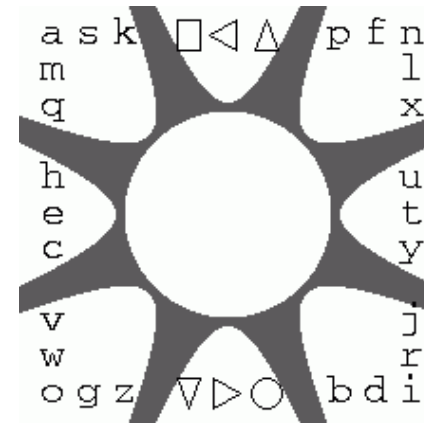


Metropolis keyboard (Zhai, IBM, 2000)

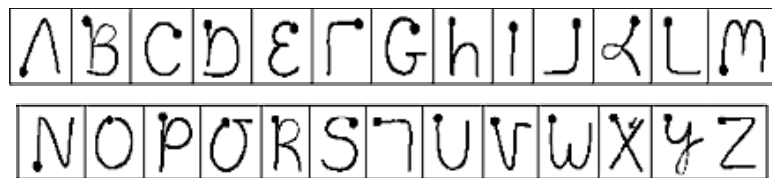
Gestures based



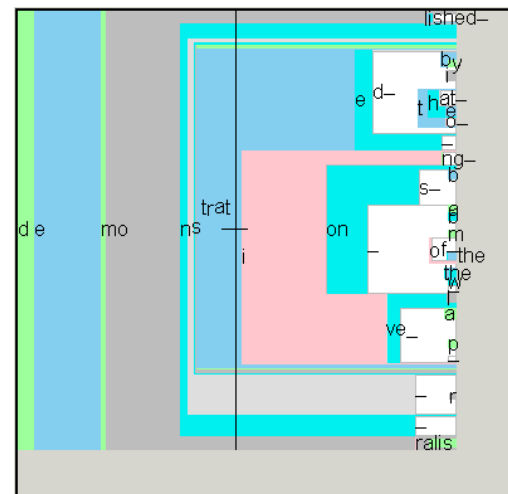
Unistroke alphabet [Goldberg 93]



QuikWriting system [Perlin 98]



Graffiti (Palm OS)



demonstrat

Dasher [Ward 2000]