

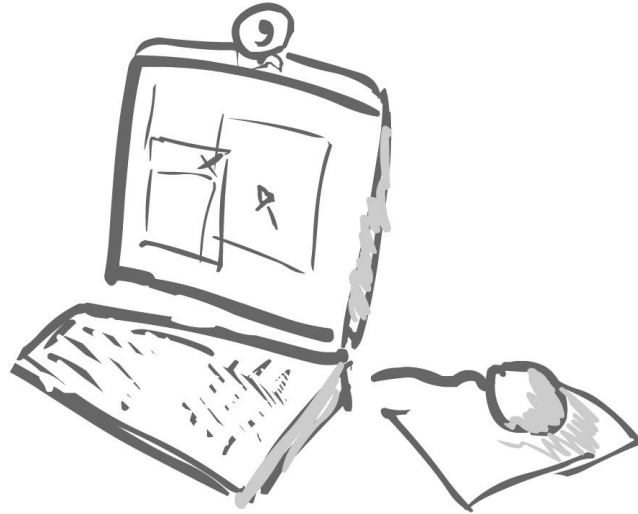
## Questions

- Final project iteration due date
- Possible marathon final presentations 12/7

## Computers today

Take 60 seconds, and sketch a computer

# Computers today



# Input devices I



Pointers



Tablets

# Voice



Game Controllers



Keyboards

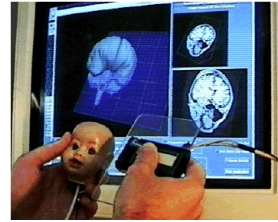
## Input devices II



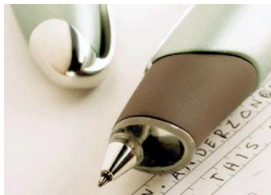
SpaceBall (6DOF)



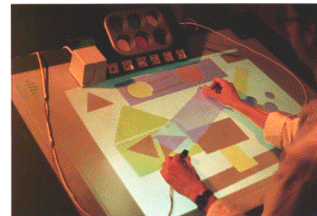
Phantom



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

## Some Insights

- Isometric or Isotonic
  - Isotonic best for position
  - Isometric best for rate control
- Relative or absolute
  - Relative saves space, eyes free
  - Absolute faster
- Direct or indirect
  - Direct is faster
  - Indirect maybe more ergonomic

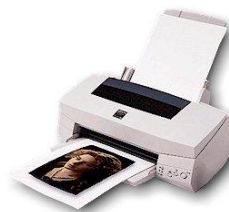
## Output devices I



Wacom



Printer



Stanford interactive Mural

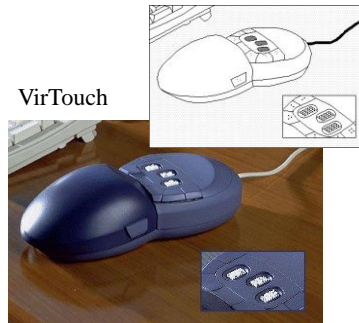


IBM (9 Mpixel)

## Output devices II



Phantom



VirTouch



Olympus Eye-Trek

Speech

## Output device 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

## **Multi Modal Control**

### **Beyond one-handed visual interface**

- Foot pedals
  - Audio interface (“put that there”)
  - Two-handed interactions – mouse plus keyboard
  - Toolglass and Magic lenses
- <http://www.youtube.com/watch?v=BwIAcczLUUA>