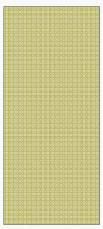
DEVELOPMENTS IN UI HARDWARE

IS4300 – FALL 2012



STONE CH 12

Choosing Interaction Devices: Hardware Components

INPUT DEVICES

DISCRETE INPUT DEVICES

- Good for precise commands
- May become overwhelming to novice users

CONTINUOUS INPUT DEVICES

- Provides more degrees of freedom
- May mimic natural actions

CONSIDERATIONS FOR INPUT DEVICES

- Size of the keys
- Shape of the device
- Robustness
- Accuracy
- Speed of Input
- Dexterity required

OUTPUT DEVICES

CONSIDERATIONS: FOR OUTPUT DEVICES

- Resolution/Color/Brightness
- Viewing/Hearing range
- Size
- Portability
- Privacy
- **Frequency of flashes (Epilepsy)**
- **Which senses it uses**

BUT WHAT ABOUT… OTHER INPUT/OUTPUT DEVICES

- **Input:**
- *Gesture Input*
- Recognition systems (Fingerprint, Iris)
- Eye Tracking
- Handwriting Recognition
- Speech Recognition
- *Touch/Table Interfaces*

- **Output:**
- Head Mounted Displays
- *Virtual/Augmented Reality*
- 3D Displays (stereoscopic)
- Projector Displays
- Heads Up Displays

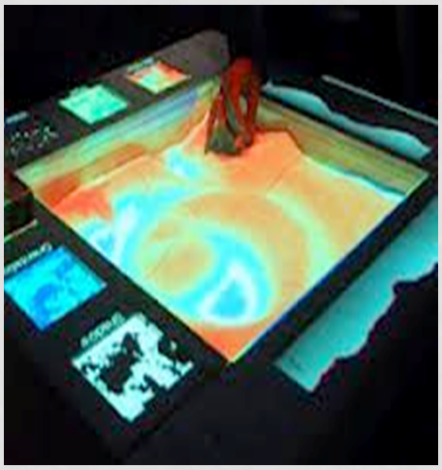
- **Other:**
- *Disability Interfaces*
- *Tangible Interfaces*
- *Brain Interfaces*
- Taste/Smell Interfaces
- Robots

DISABILITY INTERFACES

- Interfaces for users with extreme disabilities (paralysis, missing limbs, etc.)
- Often highly specialized to accommodate the individuals needs.

TANGIBLE INTERFACES

- Interfaces that provide information through physical objects/actions
- Example: Sandscape
  - Designed to help users understand landscapes by playing with the sand and seeing its digital result.



BRAIN INTERFACES

- Interface that uses brain activity (usually through IR sensors) to interact with a computer.

AUGMENTED REALITY

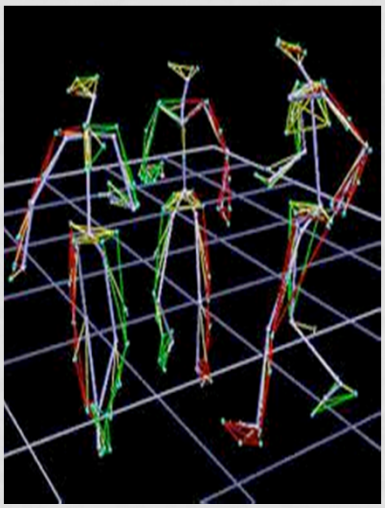
- Applications or Devices that augment the real world with additional visuals/sounds to enhance ones perception

VIRTUAL REALITY

- Computer simulated environments that simulate physical presence.

NATURAL USER INTERFACES

- Gesture Interfaces
- Multi-touch interfaces
- Interfaces a user should "Intuitively know how to use"



NATURAL USER INTERFACES ARE NOT NATURAL - NORMAN

- Gestures…
  - Differ across cultures
  - Do not leave behind records of their path
  - Require teaching (Pinch or Swipe)
  - Are dangerous…

IPAD USABILITY - NIELSEN

- The iPad has problems with…
  - Readability vs. Tapability
  - Small Touch Areas
  - Accidental Activations
  - Low Discoverability
  - Soft-Keyboards
  - Swipe Ambiguity
  - Too Much Navigation

TOUCH INTERFACES – WOLF QUESTIONS

- What finger movements are feasible?
- What areas of the design space should be avoided due to unintended input?
- What gestures should be used for common tasks?
- What feedback should be given during and at the end of a gesture?

TOUCH INTERFACES – WOLF RESULTS

There is a lot of work to be done!

Figure 3. Inertia sensors (accelerometer and gyroscope) augment fingers for detecting gestures beyond touch and slide.

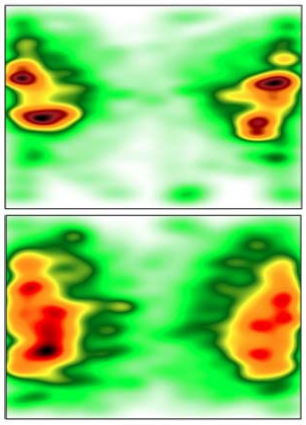


Figure 2. The touched areas at the hand-held tablet's front (top) and rear (bottom) are presented through heatmaps. The locations that are touched while grasping are displayed in dark orange, red, and brown.

STRANGE INTERFACES…

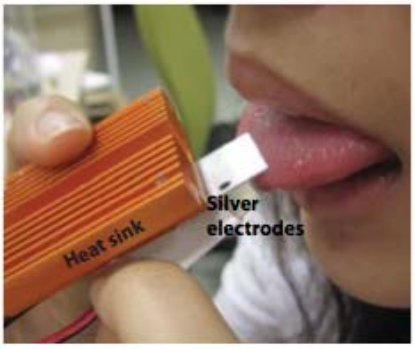
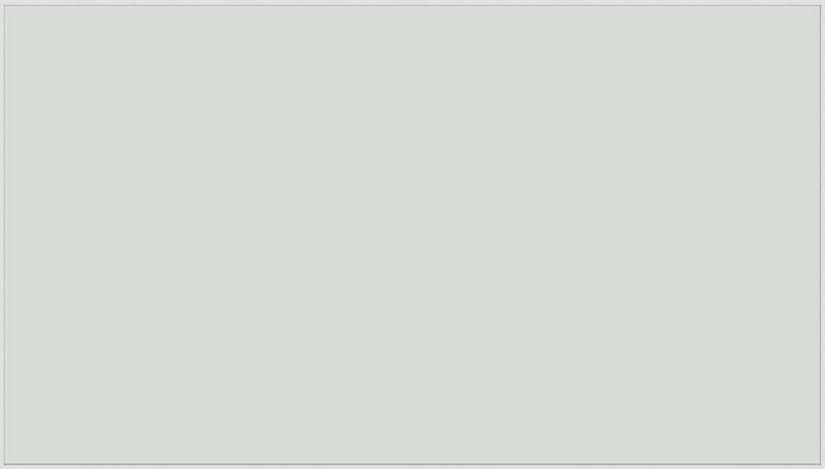


Figure 1. The tongue interface attached to the user's tip of the tongue

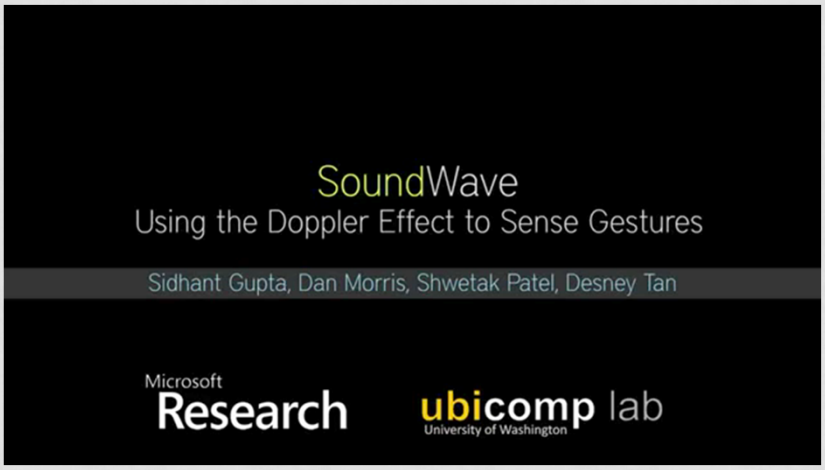
A FEW VIDEO EXAMPLES

- While watching think about:
  - When would you use this interface?
  - What are the benefits of this interface?
  - What are problems could this interface have? (Think about the considerations we discussed earlier)

LEAP MOTION



SOUNDWAVE



SIXTH SENSE

BOTANICUS

EXERCISE: USAGE DESIGN

- Get into Team Groups
- Choose one of the interfaces we discussed or saw in class today
- Discuss how you would use it in your project if you could.
- Present ideas to class in 10 minutes

FITTS'S LAW

- Developed by Paul Fitt in 1954
- Used to model the time it takes to complete a pointing action
- T = a + b log(1 + (D/W))
  - T is the time to complete the action
  - a is the intercept
  - b is the speed of the device
  - D is the distance being travelled
  - W is the width of the target
- **Pointing actions are based on the distance you need to travel and the width of the target**