HW2 Check-In

Implement gesture-based menu navigation with the Kinect.

Submit code and demo video.

Due: Next week Friday, 9/23, 5pm
Sensing & Actuation
The Sensor Zoo

Environmental
Bend

Biometrics
Position
Pressure

Touch
Position

Distance
Orientation

Acceleration
Tilt

RFID
Color

Mag Stripe
Temperature

Sound
Hall Effect

Monday, September 19, 2011
Types of Sensors

- Discrete
- Continuous
- Categorical
<table>
<thead>
<tr>
<th>Time scale/ Frequency</th>
<th>millis</th>
<th>mins</th>
<th>hours</th>
<th>days</th>
<th>years</th>
</tr>
</thead>
<tbody>
<tr>
<td># of users</td>
<td>1</td>
<td>10</td>
<td>100s</td>
<td>1000s</td>
<td></td>
</tr>
</tbody>
</table>
Time scale/
Frequency

<table>
<thead>
<tr>
<th># of users</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Interaction</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Devices</th>
</tr>
</thead>
</table>

 millis —— mins —— hours —— days —— years

1 —— 10 —— 100s —— 1000s
Custom Circuit

- Sensor
- Microcontroller

Embedded Code

Wired
(serial, USB, Ethernet)

PC

Smartphone

or wireless
(Bluetooth, ZigBee, WiFi)
~$30
Nintendo
PowerGlove
1989

http://www.intarnet.us/graphics/powerglove.jpg
FLEX SENSOR OFFERS VARIABLE RESISTANCE READINGS:

Resistance (Ohms)

Deflection (degrees)

<table>
<thead>
<tr>
<th>Resistance Value</th>
<th>Deflection Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>22.5</td>
<td>22.5</td>
</tr>
<tr>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>67.5</td>
<td>67.5</td>
</tr>
<tr>
<td>90</td>
<td>90</td>
</tr>
</tbody>
</table>

At rest nominal resistance value.
BASIC FLEX SENSOR CIRCUIT:

\[ V_{\text{OUT}} = V_{\text{IN}} \left( \frac{R_1}{R_1 + R_2} \right) \]
Japan Geigermap:
At-a-glance

This map visualises crowd-sourced radiation geiger counter readings from across Japan, and on the labels to get more information on the source of each reading.

The number of locations fluctuate due to the validity of the data feeds. There are approximately 185 feeds from the official Japanese government source MEXT and there are from other sources such as the Tokyo hackspace, universities, local councils, and concerned individuals.

Readings are aggregated by Pachube here:

- Below the average public space geiger reading for Japan (0.081 µSv per h).
- Above the average public space geiger reading for Japan (0.081 µSv per h).
- 10x above the average public space geiger reading for Japan.
- 100x above the average public space geiger reading for Japan.
- Radioactivity of water. No data on health impact.

Please donate now to relief efforts in Japan.
Click here to donate to the Red Cross.

Measurements are represented in units of microsieverts per hour (µSv/h). Original geiger counter readings use the unit nGy/h, the conversion taken is 1 Gy = 1 Sv. (See Wikipedia entry on Sieverts).

Geigermap refers to the average public space geiger counter reading for Japan, calculated from values provided by MEXT (0.081 µSv/h). These values are much lower than values one would encounter for normal background radiation, as MEXT geiger counters are calibrated.

http://japan.failedrobot.com/
Sparkfun Geiger Counter

Google Maps API

Pachube sensor data aggregator
Sleep Less. Feel Better.

With the WakeMate you wake up feeling refreshed and learn how to improve your sleep quality and efficiency.

Watch Video | Take Tour

FREE mobile app + FREE online analytics
30 day money back guarantee

NOW AVAILABLE ON

http://wakemate.com
Power Line Sensing, Patel et al., UbiComp 2007
More examples

Abracadabra (Harrison):
http://www.youtube.com/watch?v=IEM6I_ZDRyA

Minput (Harrison):
http://www.youtube.com/watch?v=XYO7Qizs9d8
Design Tools for Sensing Interactions
//detect accelerometer peaks

//read data sample
xVal[t++]=readA2DValue(xPin);

//look for changes in derivative
if((((xVal[t]-xVal[t-1]) >= 0
    && (xVal[t-1]-xVal[t-2]) < 0) ||
    (((xVal[t]-xVal[t-1]) < 0
    && (xVal[t-1]-xVal[t-2]) >= 0))

    //peak detected
    //send message
    oscSendMessageInt("/x/peak",1);
} else {
    //no peak
}
Idea: Programming by Demonstration
Idea: Programming by Demonstration
Tacit Knowledge
Crux: Generalization
Crux: Generalization
Crux: Generalization
Exemplar

Demonstrate

Review

Edit
Exemplar

Demonstrate

Export

Review

Edit

Monday, September 19, 2011
Dynamic Time Warping

Demonstration Signal

Matching Input Signal

[Sakoe, H. Chiba, S. ‘78]
Interactions

[sketches by Wendy Ju]
Zhang/Hartmann
Building Upon Everyday Play.
Actuation
The Actuator Zoo

- Solenoids
- Peltier Junctions
- Shape memory alloys ("muscle wire")
- Stepper Motor
- Servo Motor
- DC Motors
- Electromagnets
Examples: Electromagnets
Examples: Electromagnets
Examples: Electromagnets
Examples: Electromagnets
Examples: Electromagnets

Madgets:

http://youtu.be/DVIHrySzclI
Examples: TeslaTouch

Bau et al, Disney Research

Figure 1: TeslaTouch uses electrovibration to control electrostatic friction between a touch surface and the user's finger.

TeslaTouch:
http://youtu.be/3l3MDNZk-3I?t=28s
Touch Screens with Feedback

Poupyrev, Rekimoto:
Touch Screens with Feedback

Pneumatic Displays (Harrison, CHI09):

http://www.youtube.com/watch?v=Smai_Z_galE