Hardware Platforms

**Sensors**

- Convert physical parameters into electrical signal
- Types:
  - temperature
  - humidity
  - force/pressure
  - audio
  - touch
  - proximity
  - light
  - movement

- Pervasive computing requires small form factor and low-power
  for embedding devices into everyday objects
Movement sensors

- **Accelerometers**
  - measure acceleration forces (static or dynamic) caused by moving or vibrating the sensor
  - **Static**: acceleration due to gravity
    - angle of tilt of device, relative to the Earth
  - **Dynamic**: due to motion of device
    - Is the device falling? flying horizontally? etc.
  - Used primarily for device orientation
Movement sensors

- **Accelerometers**
  - **Considerations**
    - analog vs digital
    - number of axes
    - maximum swing
    - sensitivity
    - bandwidth
  - generally low cost and purchased in bulk

E.g. Ada fruit 2/4/8g 14bit
Output 3-Axis
Accelerometer
Light sensors

- Light sensors
- measure light intensity at various wavelengths
Light sensors

- Light sensors
- measure light intensity at various wavelengths

![Light spectrum diagram](image)
Light sensors

• Light sensors
  • CCD and CMOS detectors

• Hyperspectral sensors

• Small (single unit) light sensors
Proximity sensors

- **Proximity**
  - detect the presence of nearby objects without any physical contact

- **Types:**
  - Infrared sensors: measures infrared light radiating from objects in its field of view
  - Capacitive sensors: produce an electrostatic field deformed by nearby object
  - Ultrasonic proximity sensors: transmit a short burst of sound towards a target, which reflects the sound back to the sensor
Touch sensors

- **Resistive**
  - Lower cost
  - High resistance to liquids, etc.
  - Requires press down with any object, e.g. stylus, finger, glove
  - Less sensitive to light touch
Touch sensors

• Capacitive

• Electrostatic field generated over the screen
• Touch distorts this field
• Results in change in capacitance
• Requires touch with an electrical conductor
• e.g. not gloves
Low-cost Touch Sensors

Resistive touchscreen for Pi $39.95

Adafruit capacitive touch shield $12.50
New Touch Sensors

• Force touch
  • Developed by Apple
  • Senses amount of force exerted on a touchpad or display
Temperature, humidity, audio

Temperature & humidity

Sound localization