Physical Interaction Design
using Processing



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Interaction: a cyclic process in which two actors alternately listen, think, and speak.

-Chris Crawford, *Understanding Interactivity*

Physical Computing: methods for creating a greater range of human physical expression using computers.

-me

The Big Bounce

Christina Goodness

The Crowd In Us

Beliz Demircioglu

Music Blocks

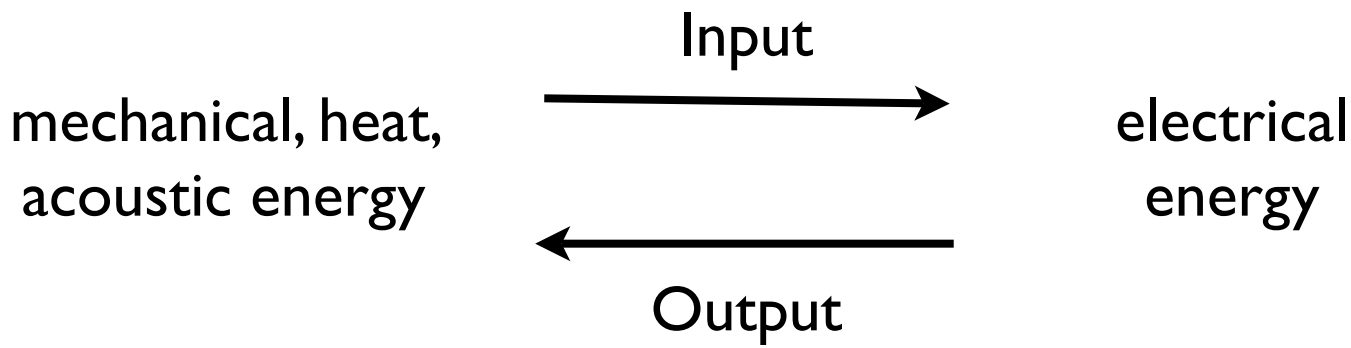
Jon Kirchherr, Jeff Gray, Michael Horan

How We See the Computer

How We See the Computer

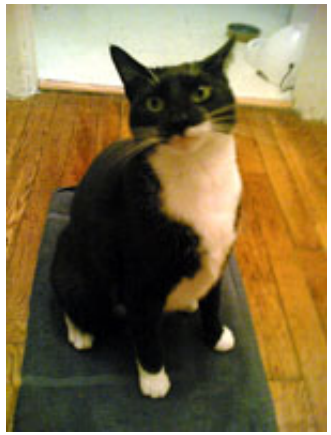
How The Computer sees us

Transduction: the conversion of one form of energy into another.

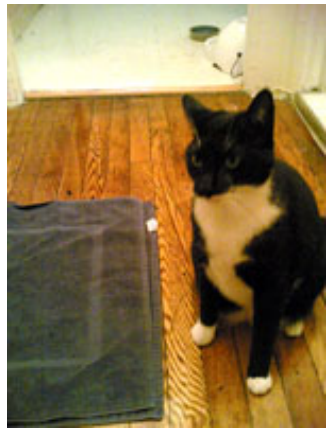


Sensors convert changes in various forms of energy into changes in electrical energy

Digital (Discrete) sensors: can sense a limited number of discrete states (mostly only two, on or off)

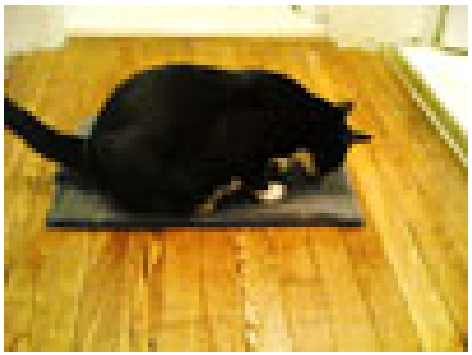


The cat is on the mat



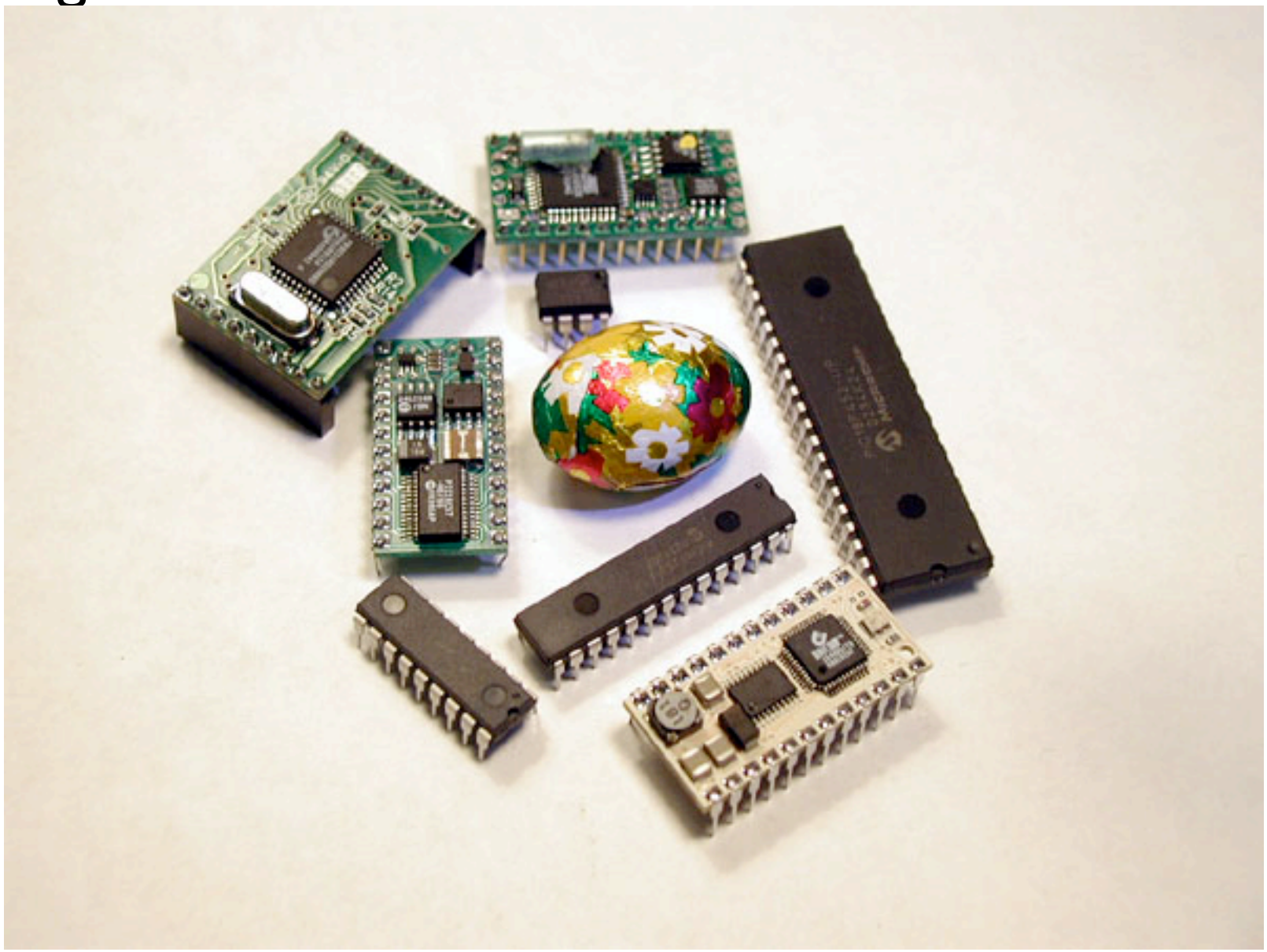
The cat is not on the mat

(Analog) sensors: can sense a continuous range of states

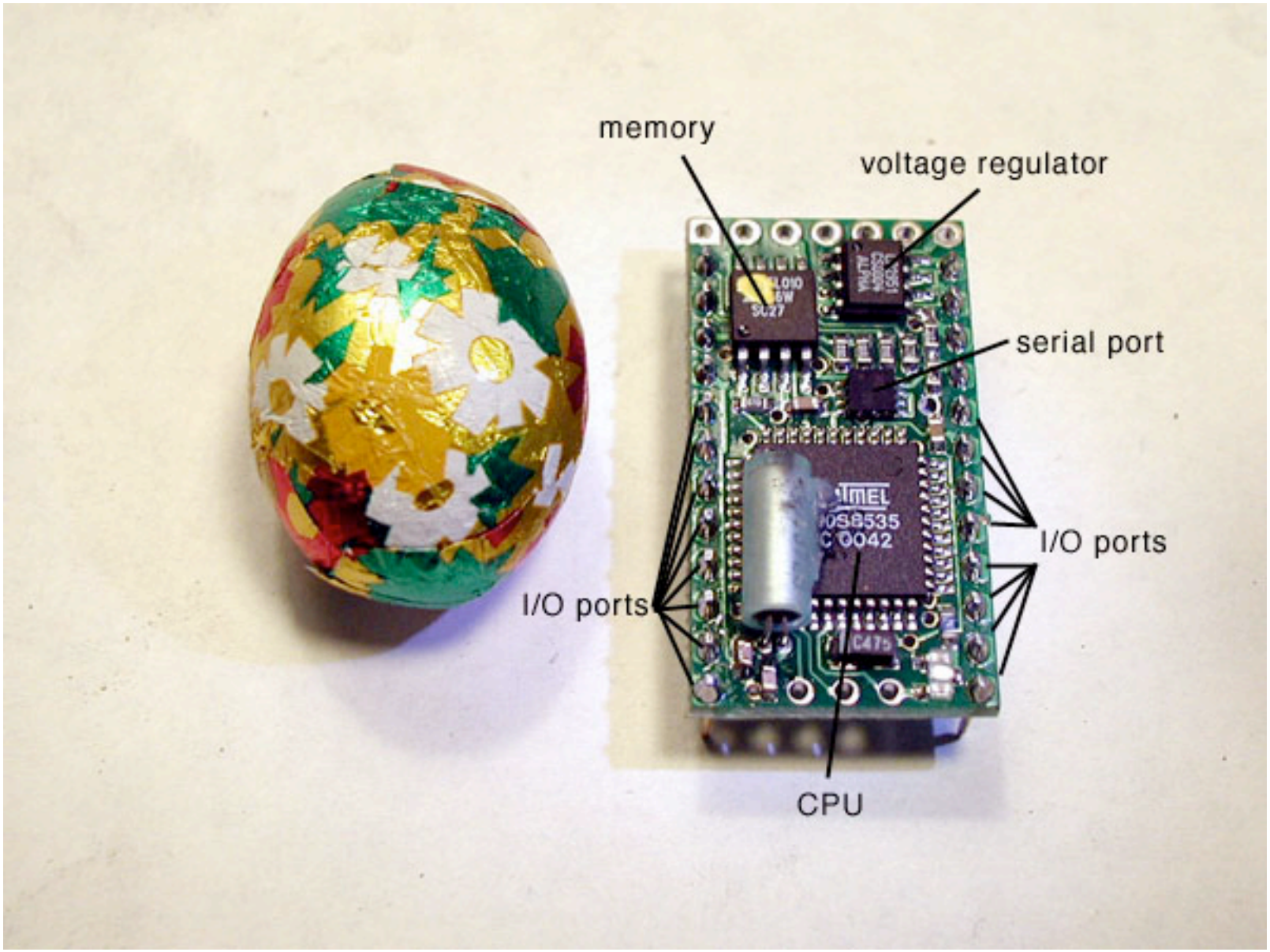


How fat is the cat on the mat?

Microcontrollers are simple computers designed to read sensors and convert the results into digital data.

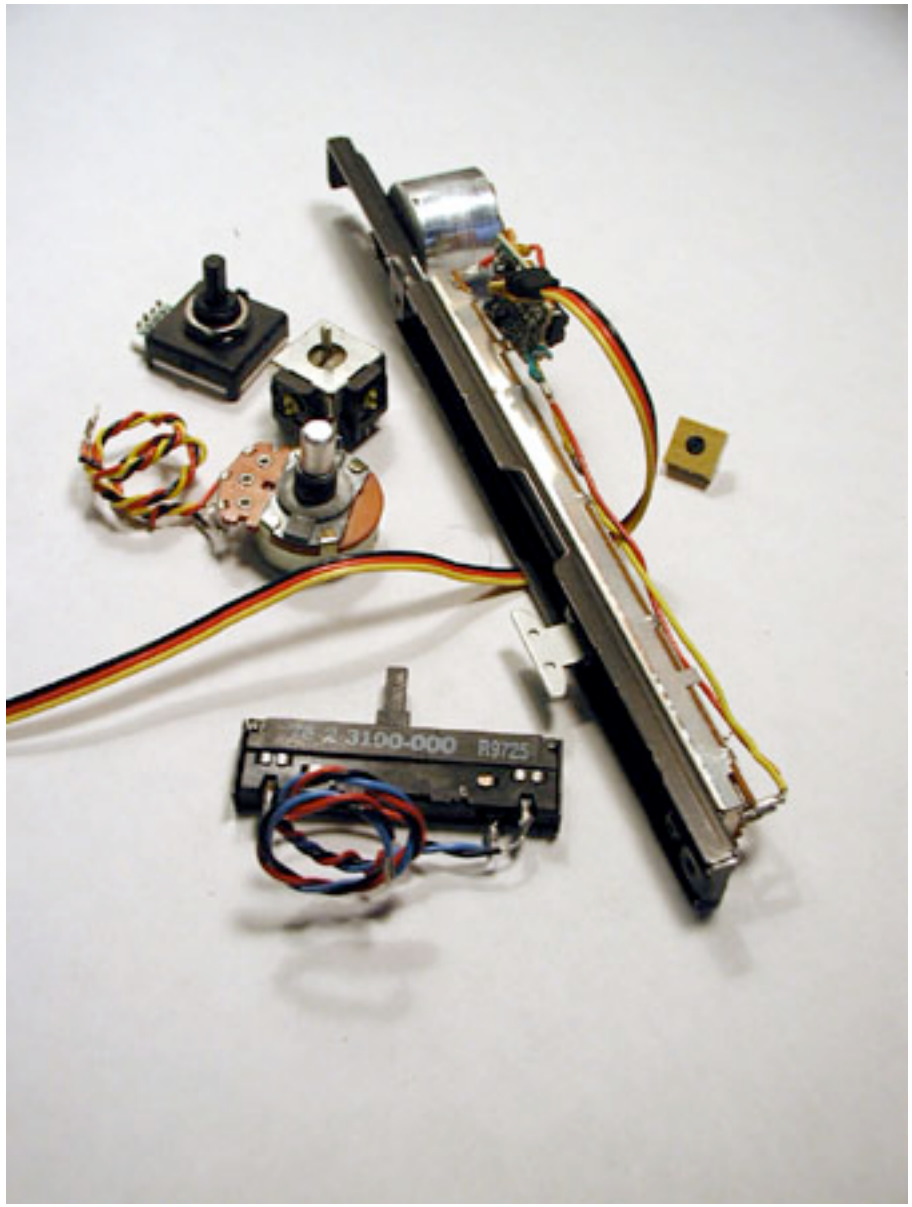


Parts of a microcontroller



Digital Sensors (switches, pushbuttons, etc)

Analog Sensors (knobs, sliders, etc.)



More analog sensors (light sensors, heat sensors)

Sensor Communication:
Communication Between People and Computers

Conscious actions

Action is primarily intended to send the computer a message

Physical affordance should be clear and obvious

Sensing is often in a very contained area

* Examples:
    - o Buttons
    - o Knobs
    - o sliders
    - o keys
    - o card swipers

Unconscious actions

Action has some other primary purpose, and sending the computer a message is a secondary effect

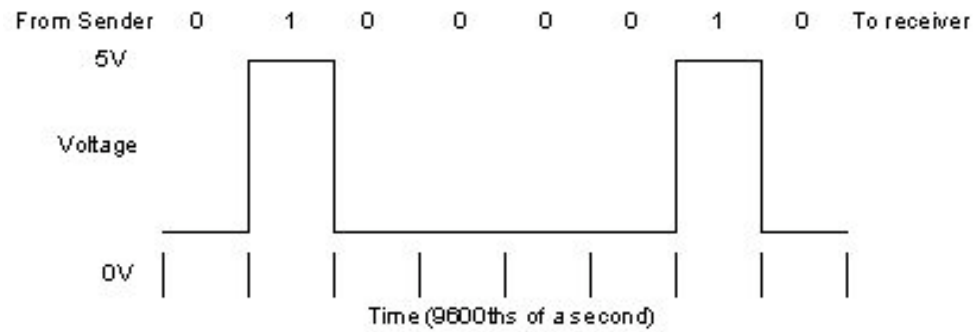
Physical affordance may not be obvious

Sensing may be across a wide area (too wide an area may result in false triggering)

* Examples:
    - o Door entry sensors
    - o floor triggers
    - o faucet sensors
    - o motion detectors

Serial Communication:
Communication Between Computers

Serial communication involves sending timed pulses of electrical energy
from one computer to another, and interpreting the pulses on the receiving computer



Sending "A" from one computer to another - what the electrical signal looks like over time.

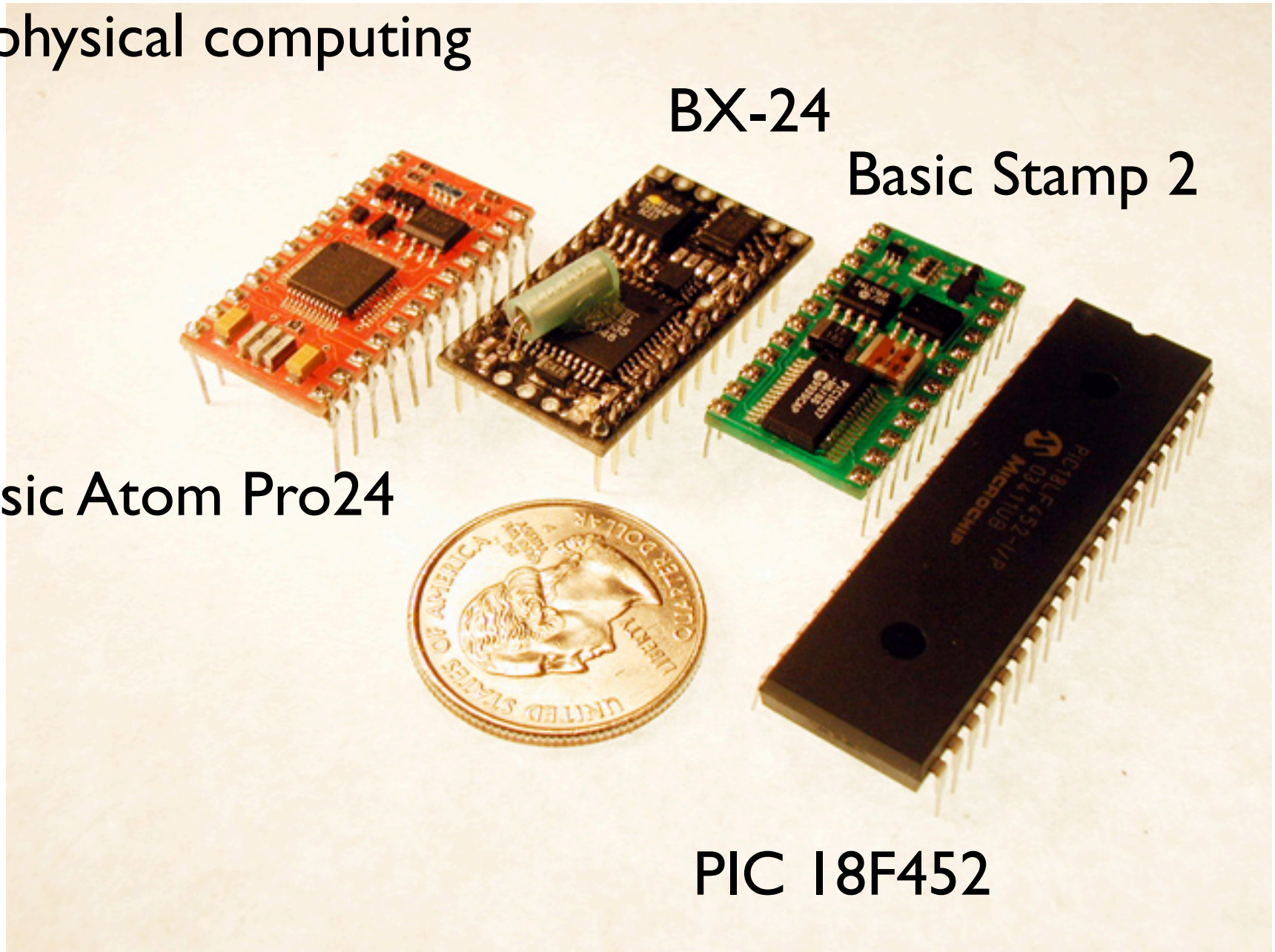
To connect two computers, you need:

- Physical agreement - which wire connects to which?
- Electrical agreement - are both computers communicating at the same voltage levels?
- Timing agreement - Are both sending and receiving data at the same speed?

USB, Firewire, Ethernet, Bluetooth are all just complex forms of serial communication.

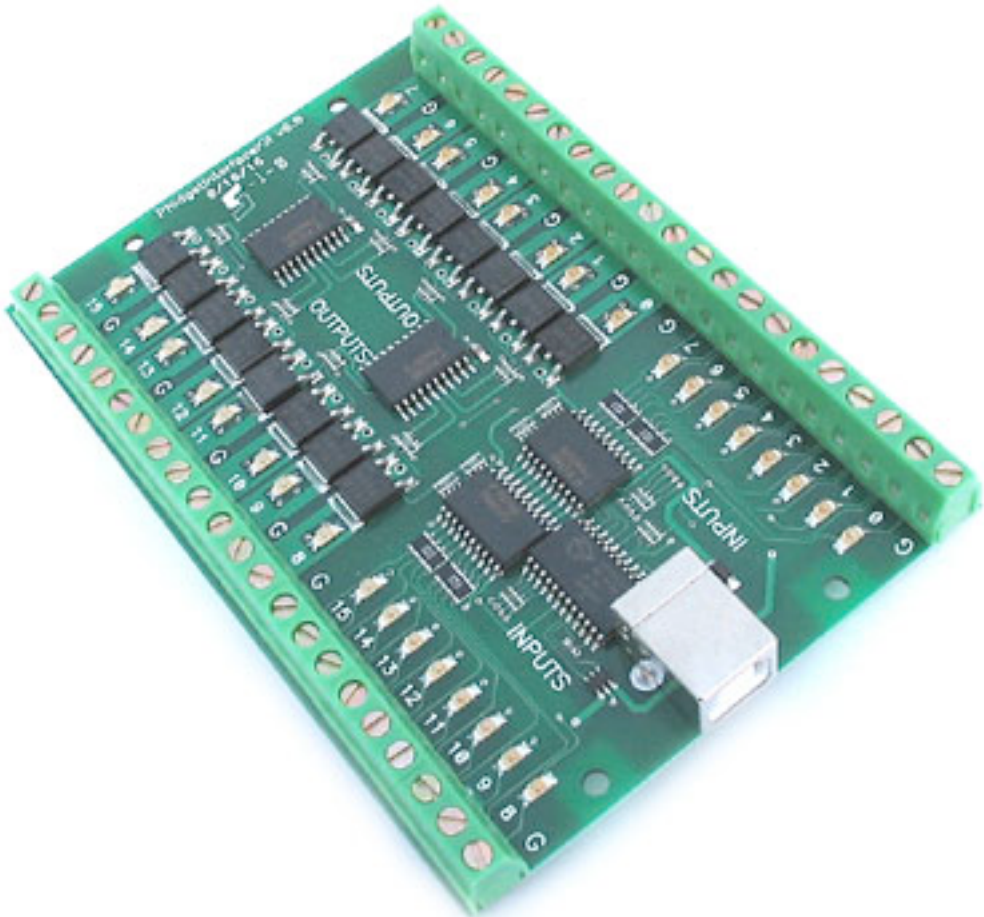
Demonstration Time

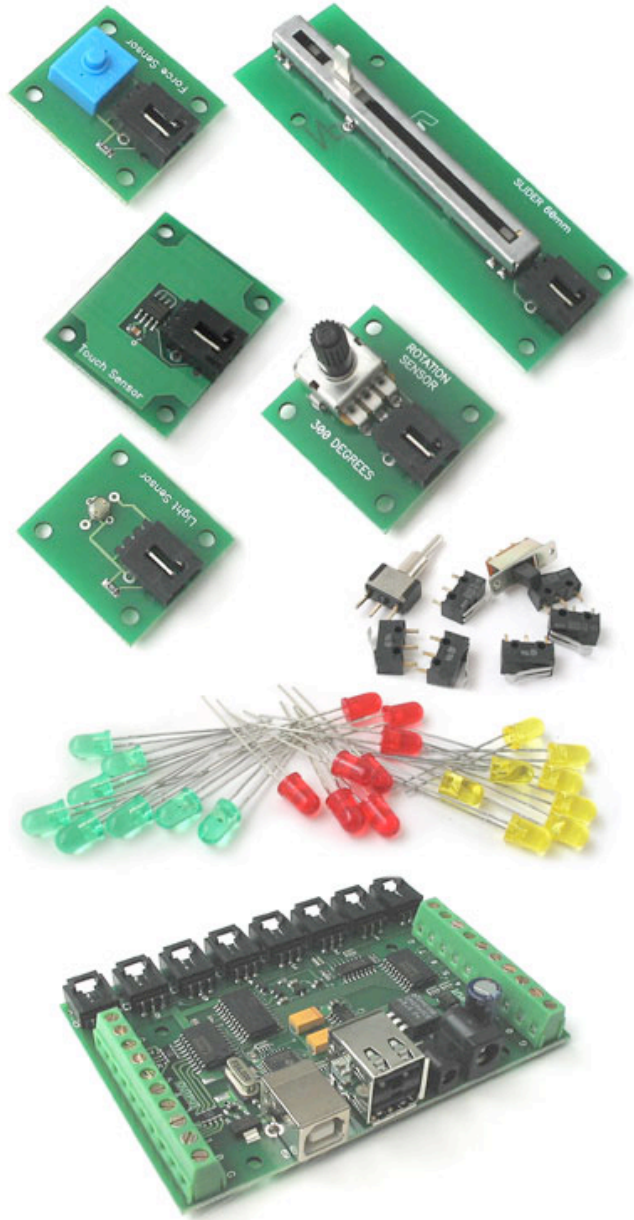
A few microcontroller modules for physical computing



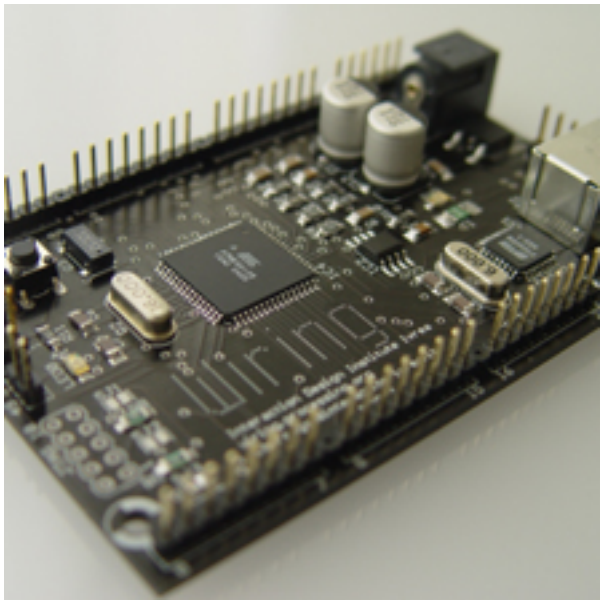
A few microcontroller modules for physical computing

Phidgets

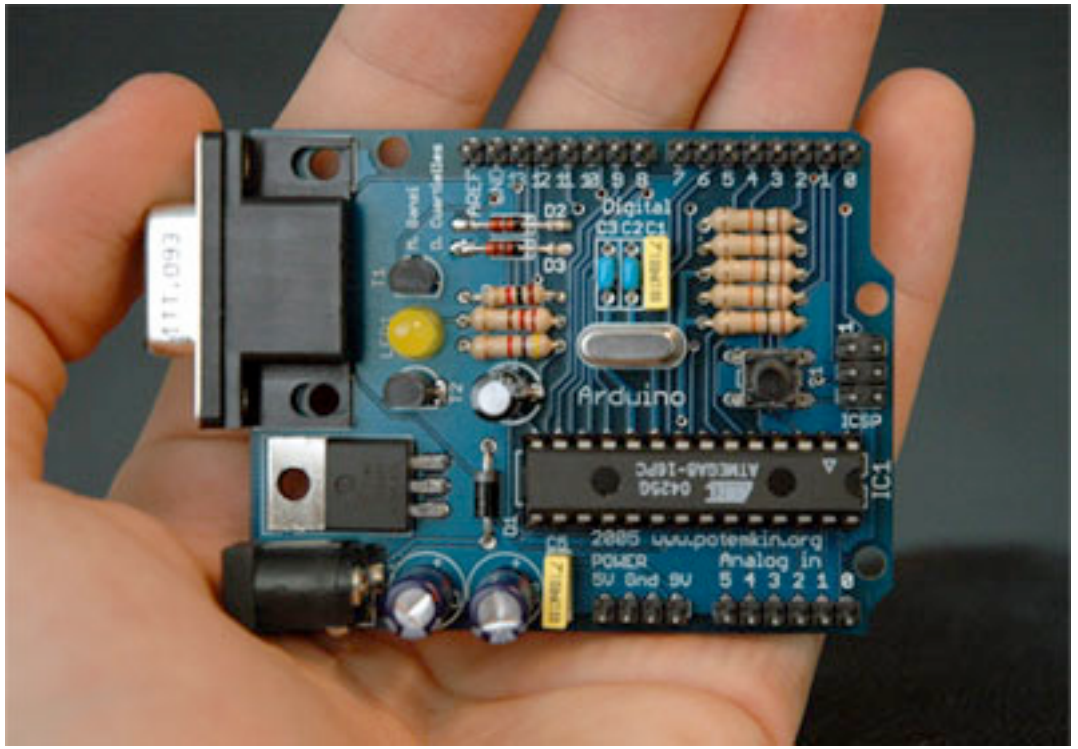




A few microcontroller modules for physical computing



Wiring



Arduino

A few microcontroller modules for physical computing

More info:

http://tigoe.net/workshops/flashforward05/

http://tigoe.net/pcomp/