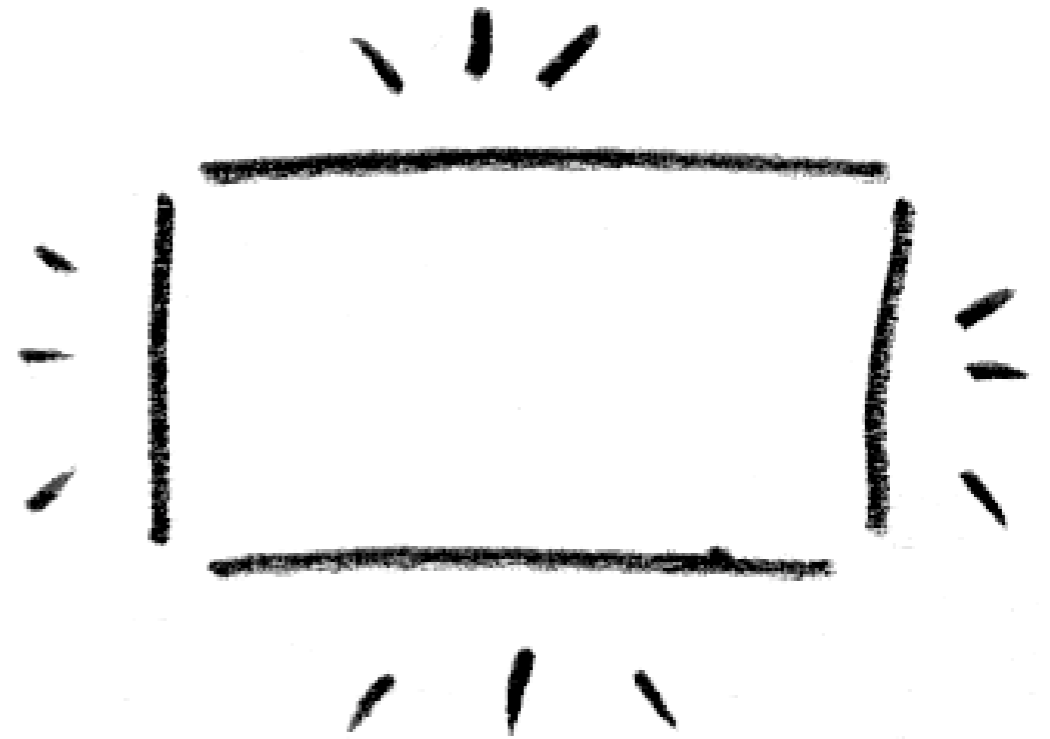
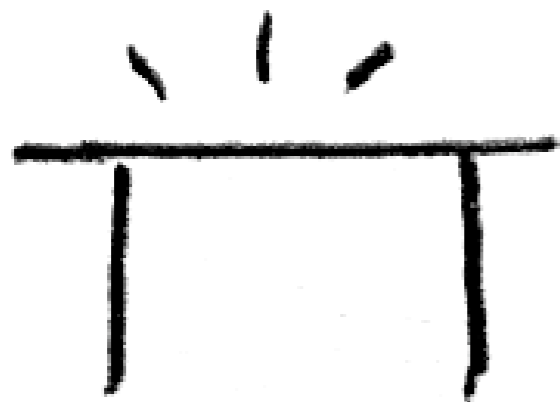


Physical User Interface Prototyping Toolkits

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January 23, 2008

With
Shane Weddle, Mad Catz





VOLTREG

MALECONN

CONNECT

JUMPERS

MING

WASHBATT

SWITCHES.

PUSHBUT

ALLICLIP

DIPSWITCH

9V HOLD

9V

9VHOLD

WASHHOLD

BATT



Toolkits

Visual Ubicomp UI Prototyping Software

iStuff Mobile, Exemplar,...

Ubiquitous Technology Prototyping Middleware

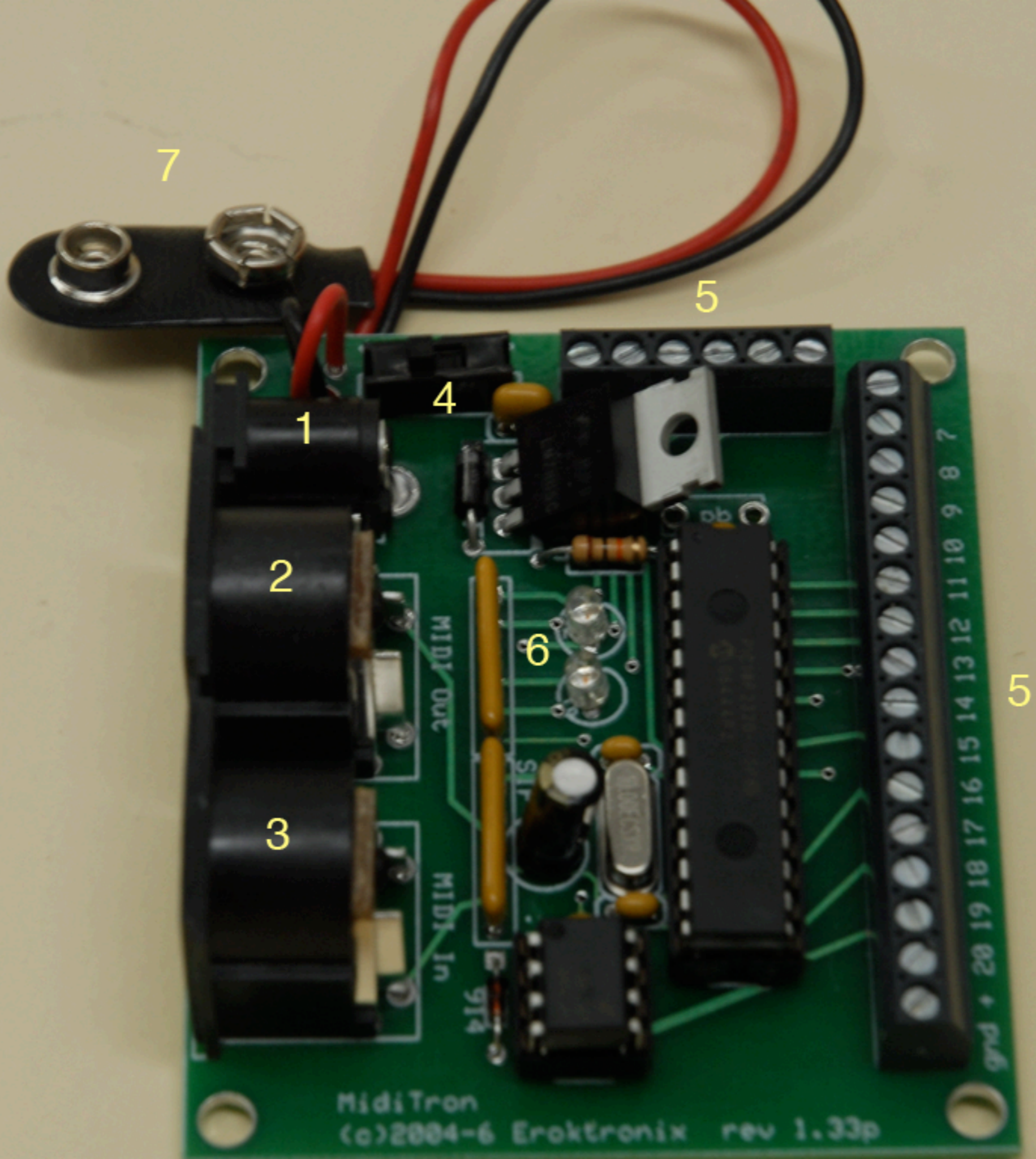
iStuff, d.tools, (Phidgets),...

Programmable μ Processor Boards

Arduino, Wiring, MAKE Controller, iCubeX, Basic Stamp,...

Dumb Interfaces to Sensors & Actuators

MidiTron, MidiTron Wireless,...



7

5

4

1

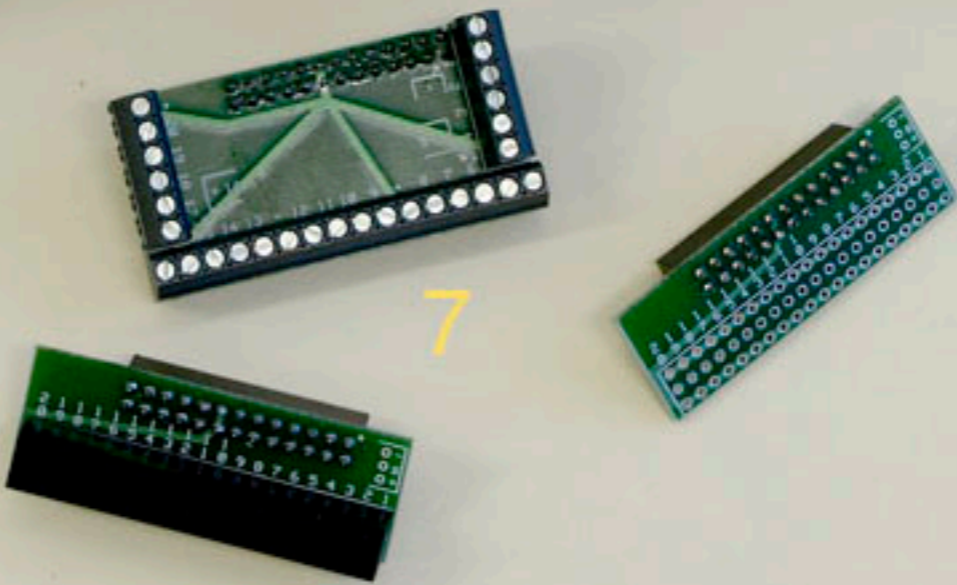
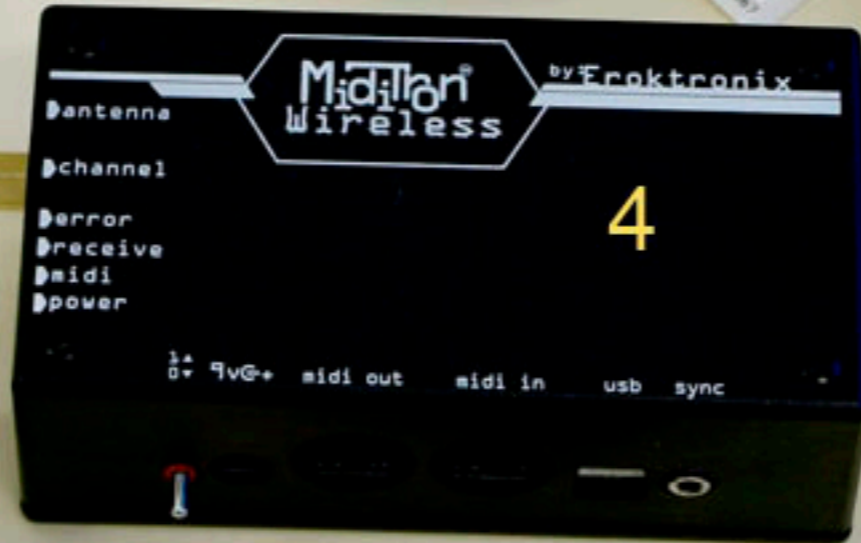
2

3

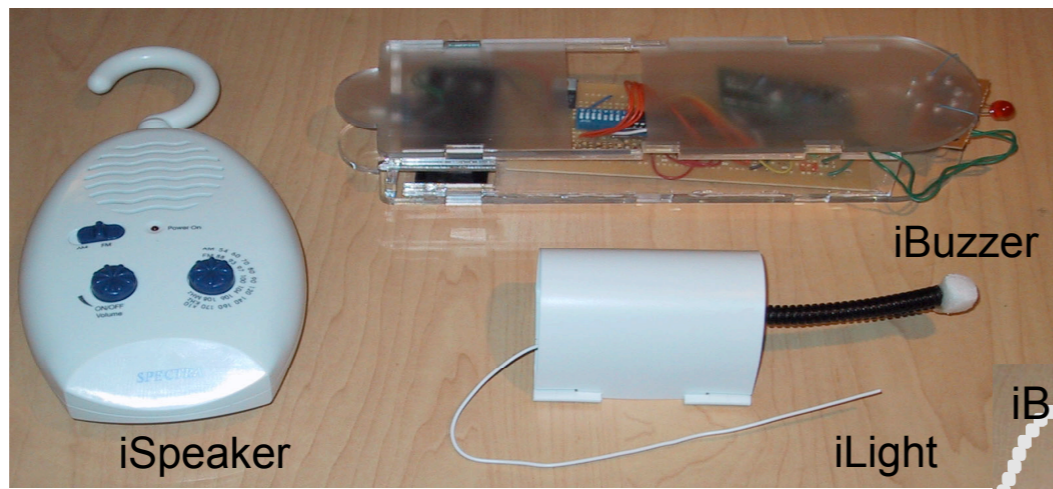
6

5

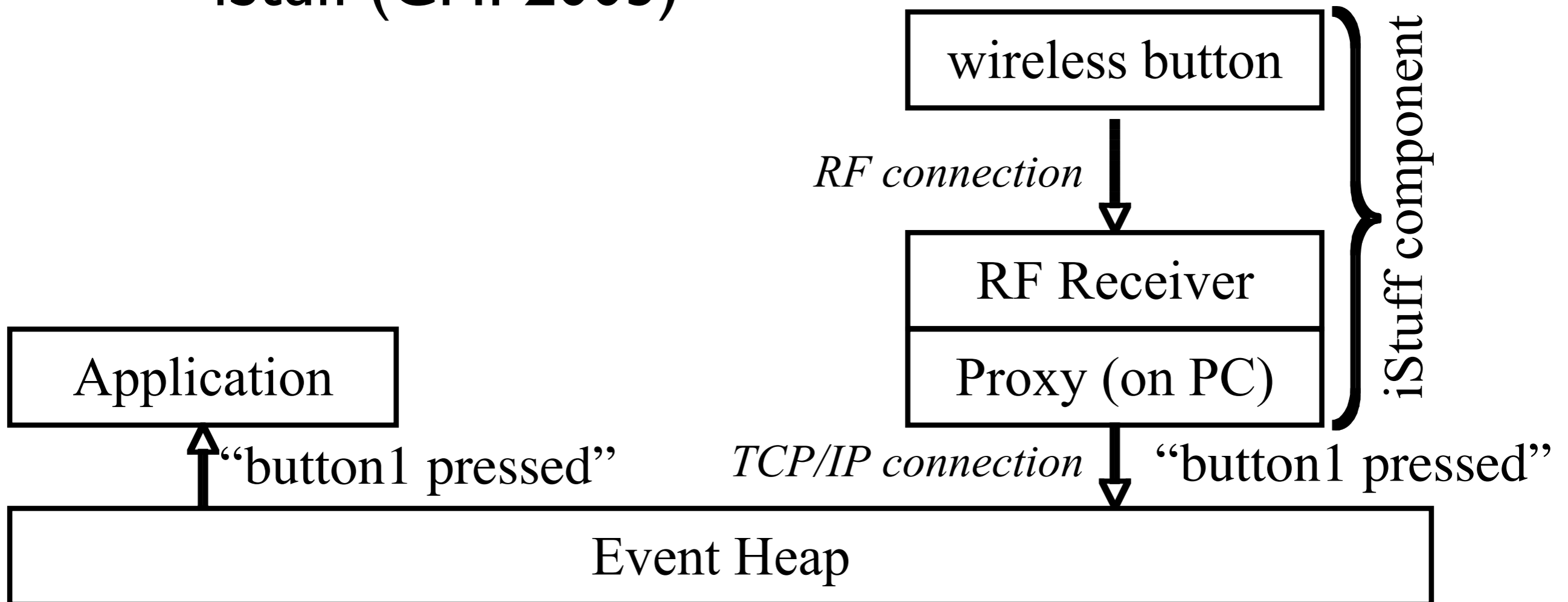
MidiTron
(c)2004-6 Eroktronix rev 1.33p

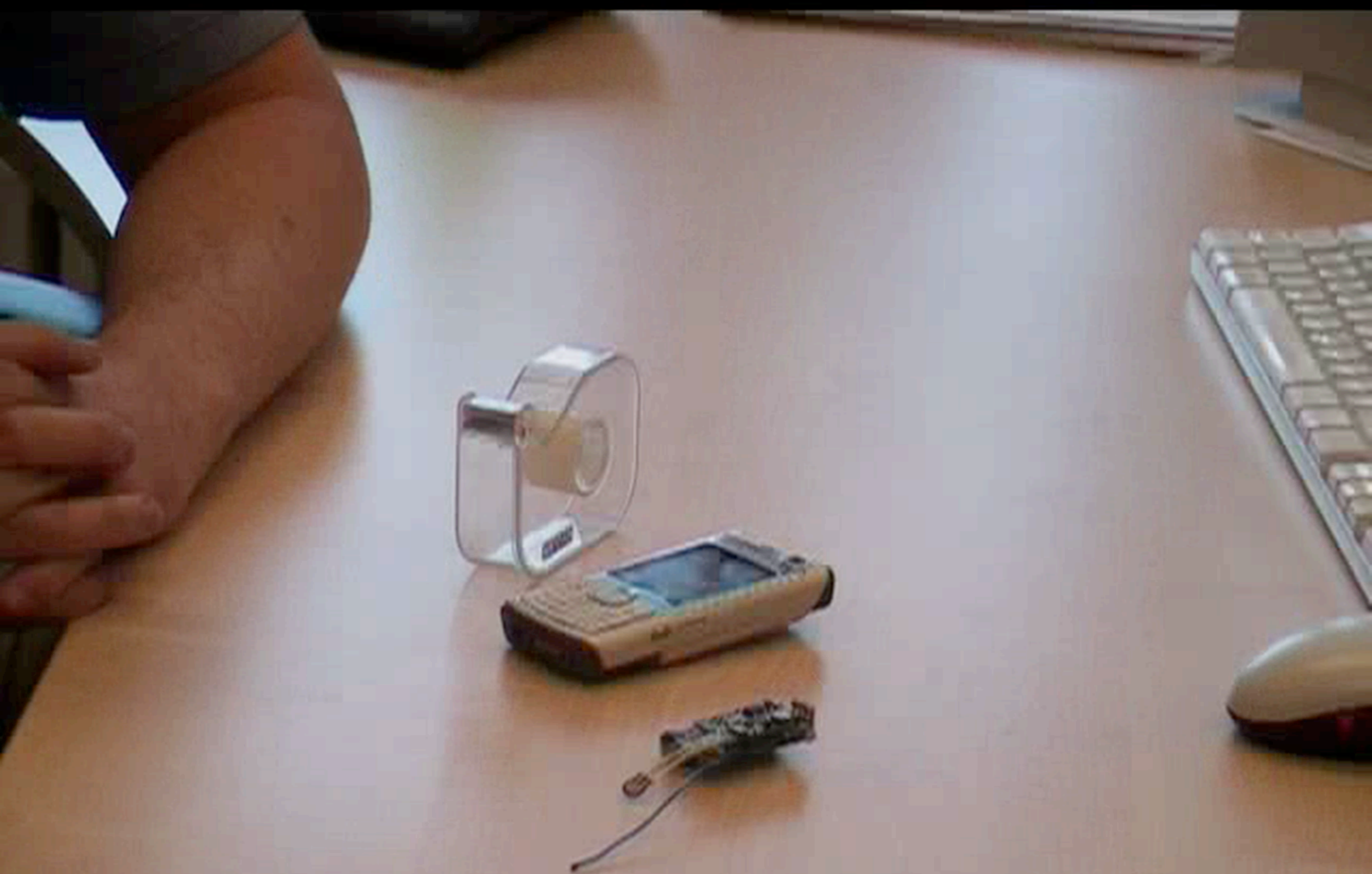


	MIDI	Serial	USB	BT	Stand-alone
Win/Mac/ Linux	iCubeX \$\$\$ ●		● Phidgets \$\$ ● MAKE Con- troller \$\$ ●	● Arduino \$ ●	● ●
Win/Mac					
Win		●	Basic Stamp ● \$\$		●



iStuff (CHI 2003)





<http://hci.rwth-aachen.de/videos/istuff/iStuffMobile.mov>

6 PWM 'analog' out 14 digital I/O (40mA)

USB

ICSP

USB
power

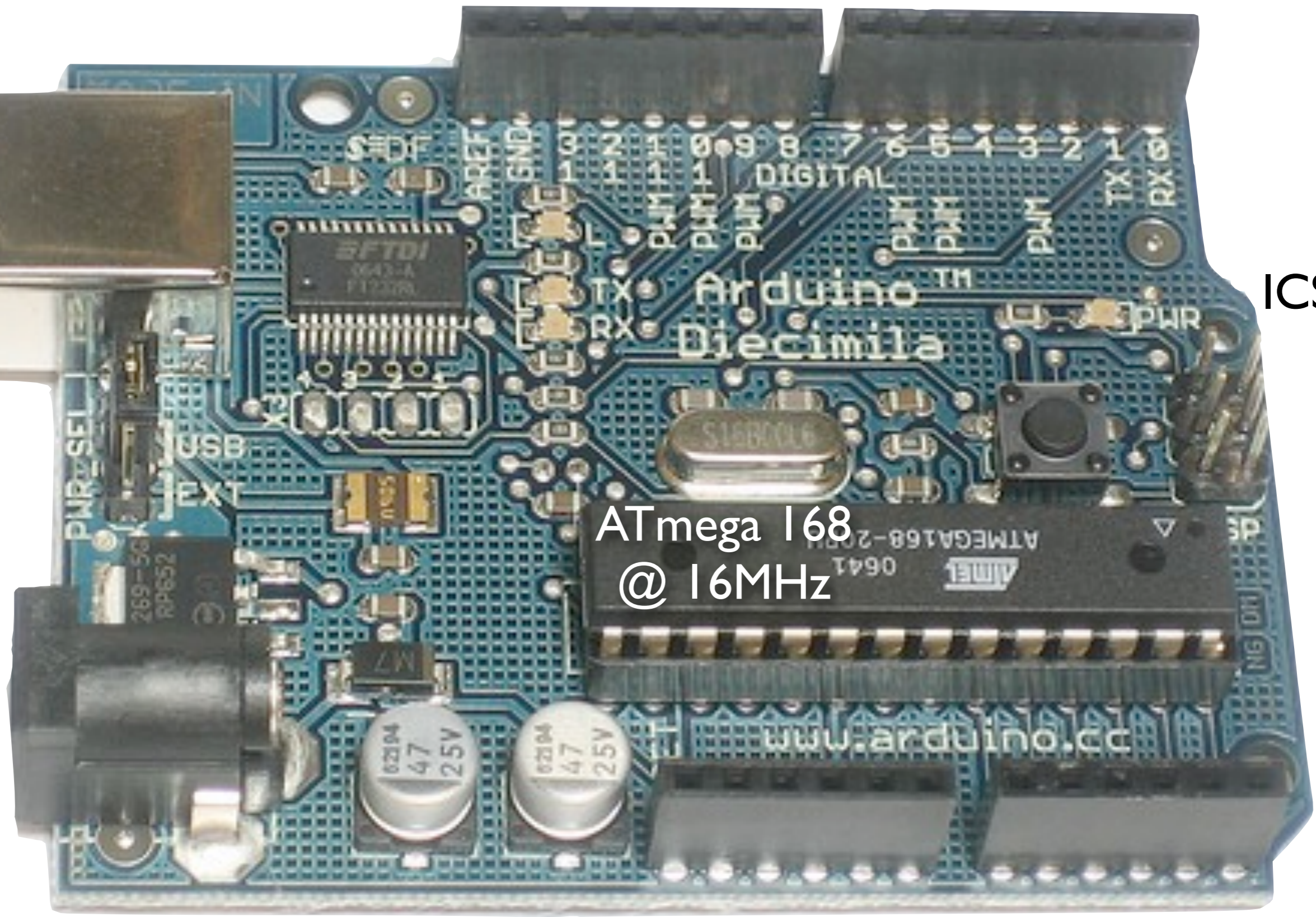
...or...

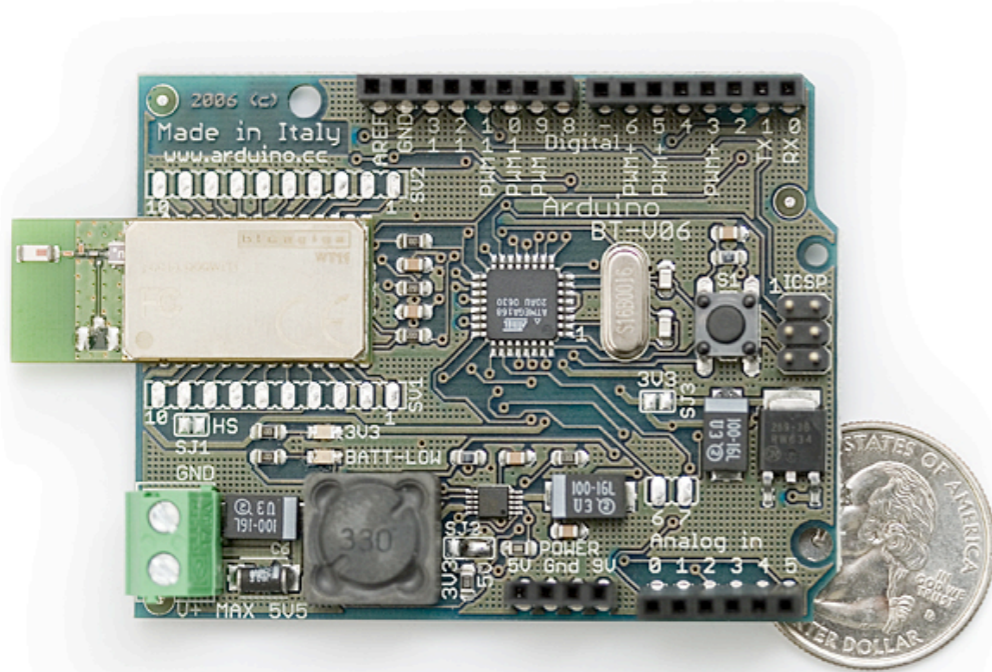
7-12V
in

ATmega 168
@ 16MHz

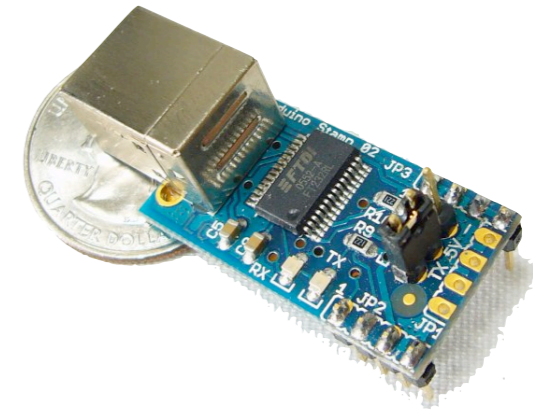
3.3 & 5V

6 analog in

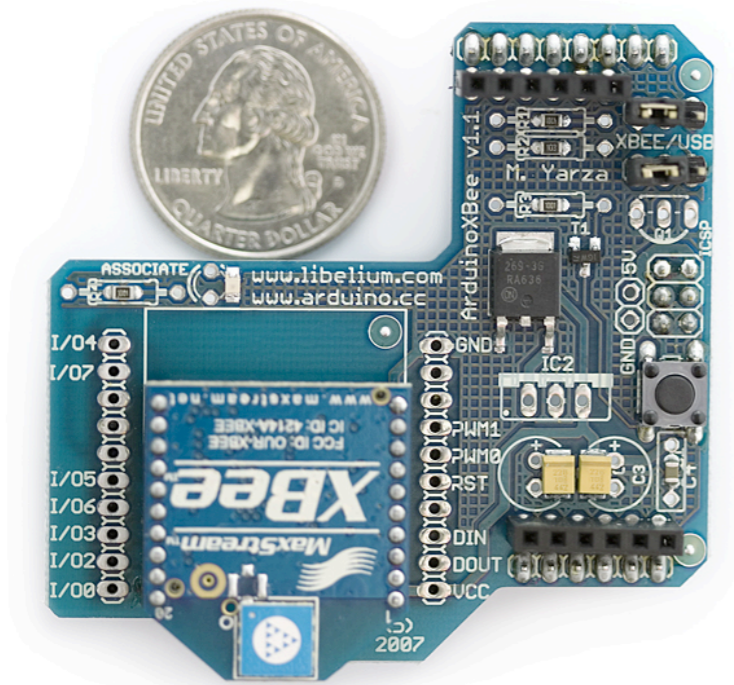




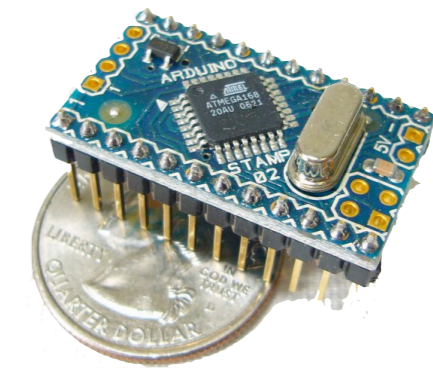
Arduino Bluetooth

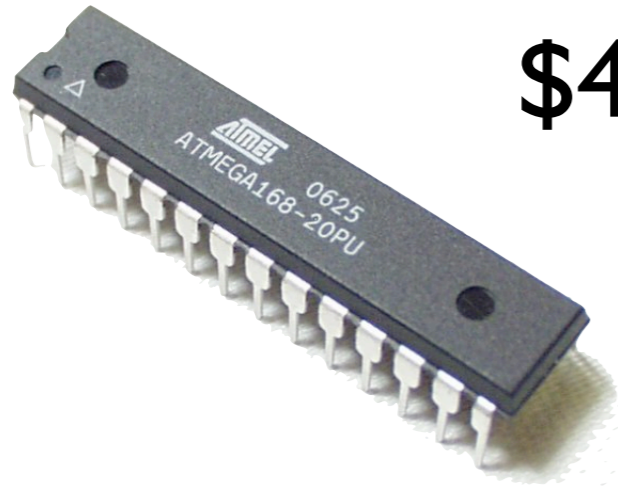


Arduino Stamp
& USB board



Arduino ZigBee

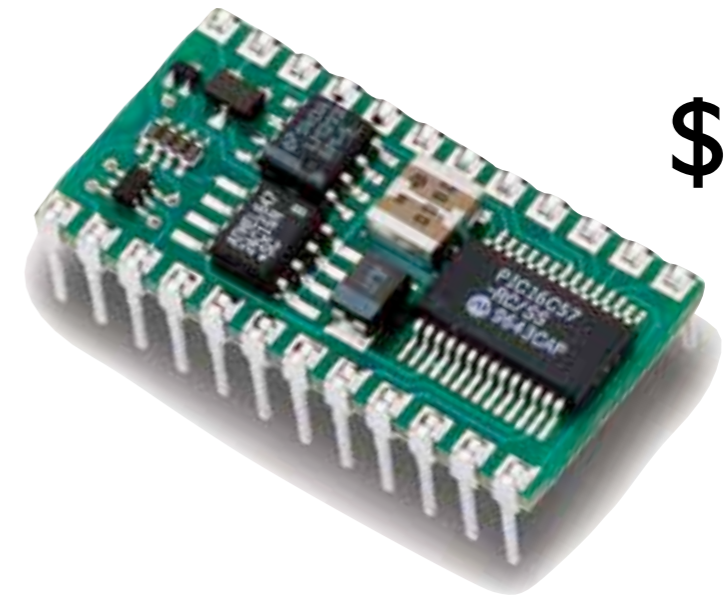




\$4

Arduino

```
int ledPin = 13;
void setup() {
  pinMode(ledPin, OUTPUT);
}
void loop() {
  digitalWrite(ledPin, HIGH);
  delay(1000);
  digitalWrite(ledPin, LOW);
  delay(1000);
}
```



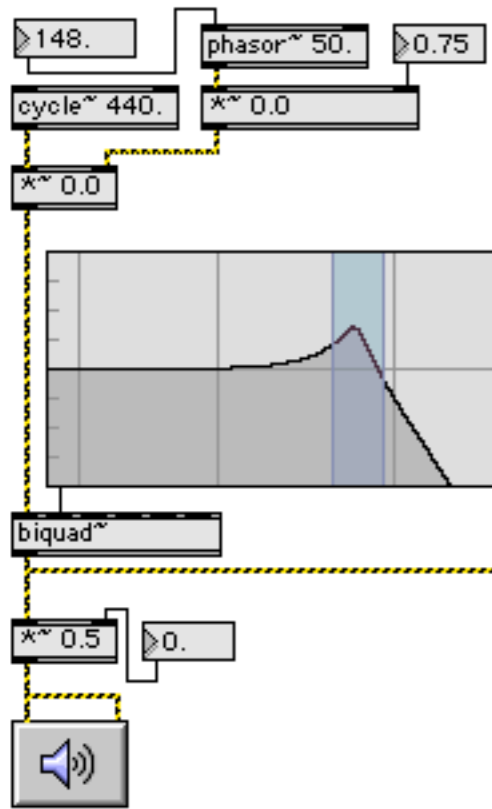
\$50

Basic Stamp

```
' {$STAMP BS2}
' {$PBASIC 2.5}
OUTPUT 14
DO
  HIGH 14
  PAUSE 1000
  LOW 14
  PAUSE 1000
LOOP
```

Arduino Language

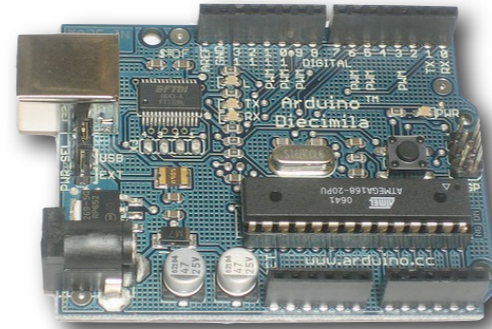
- C with some C++ constructs
- Similar to Processing (for visual programming)
- Links against AVR-libc (open-source gcc library for Atmel μ Controllers)
- All programs have **setup()** and **loop()**
- Of note: digital & analog I/O, pulse and shift output, timers, interrupts, serial communication, port manipulation, flash memory access



Max/MSP

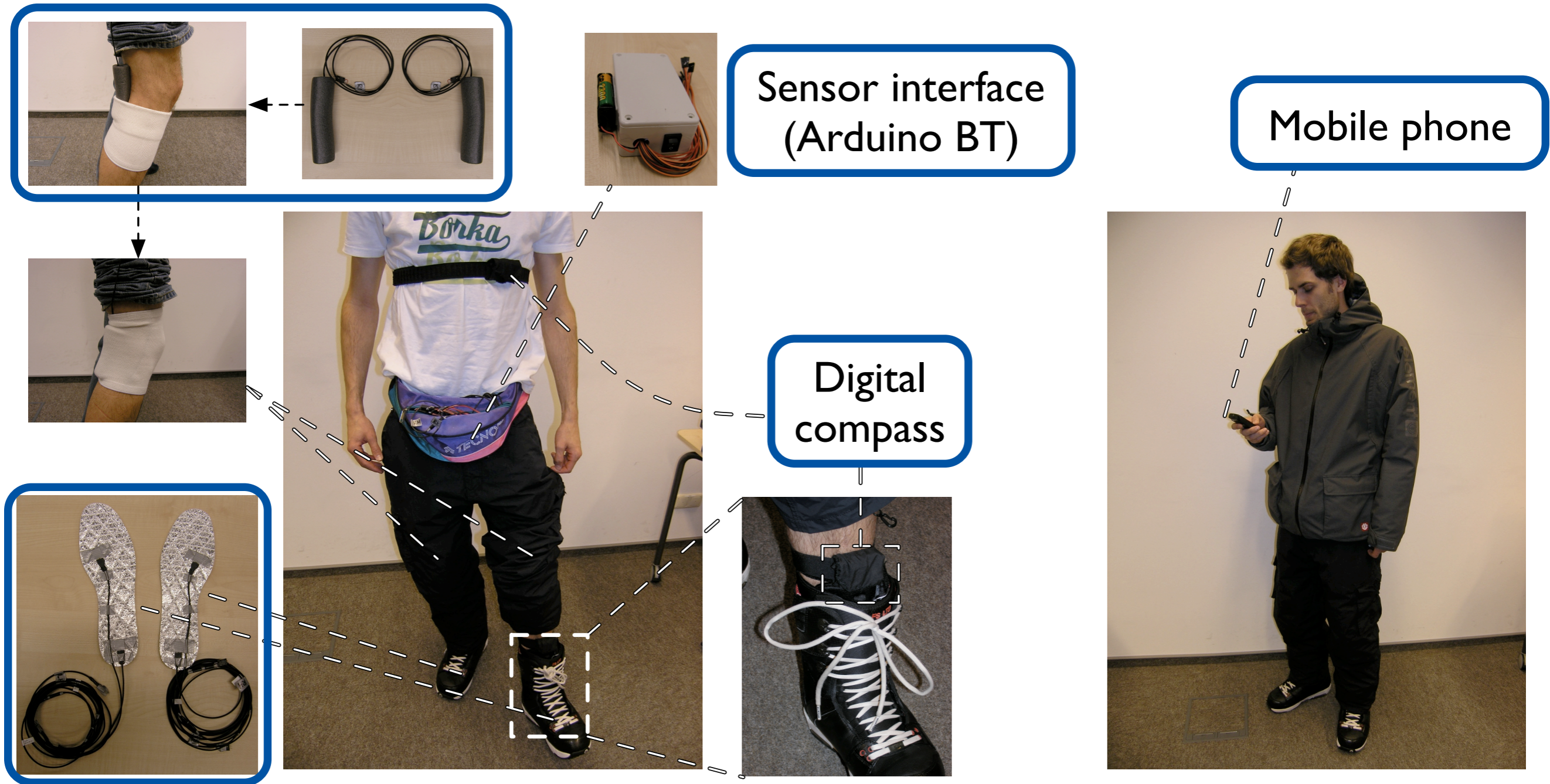


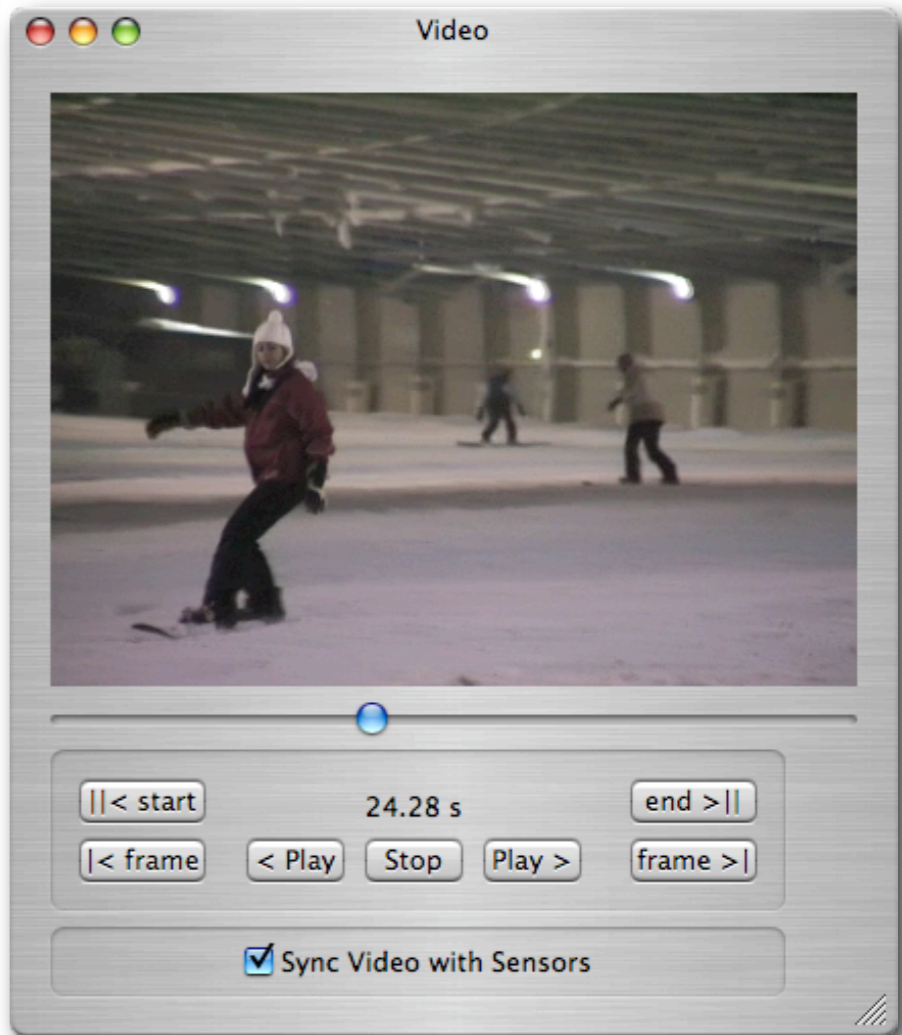
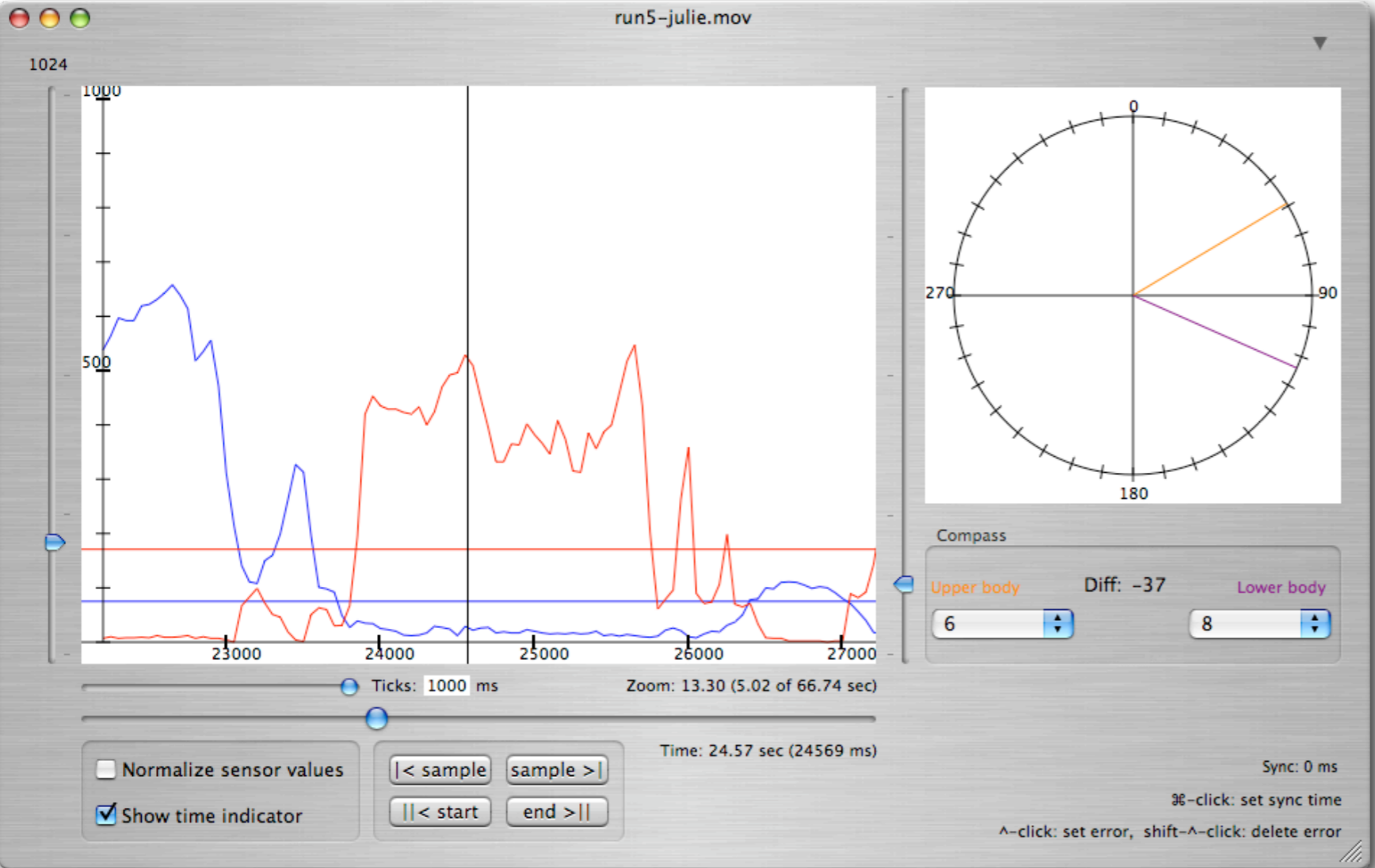
Flash



Processing

Arduino Example: Wearable Snowboard Assistant







Sonic Body

Arduino and You

1. Buy \$35 Arduino USB “Diecimila” board, download and install free development IDE & USB driver (all via www.arduino.cc)
2. Plug in board using a USB printer cable, launch IDE, select menu “Tools:Serial Port:/dev/tty/usbserial...”, select “File:Sketchbook:Examples:Digital:Blink”, then select “File:Upload”
3. There is no step 3

If it doesn't work

- Select “Arduino Diecimila” in the “Tools:Board” menu
- Windows users, use “run.bat” to launch IDE instead of executable
- Get latest USB driver from <http://www.ftdichip.com/Drivers/VCP.htm>

Summary

- The case for physical prototyping toolkits
- Dumb interfaces, μ Controllers, middleware, IDEs
- Arduino: modern, open-source, cross-platform, cheap
- <http://hci.rwth-aachen.de/toolkits>