

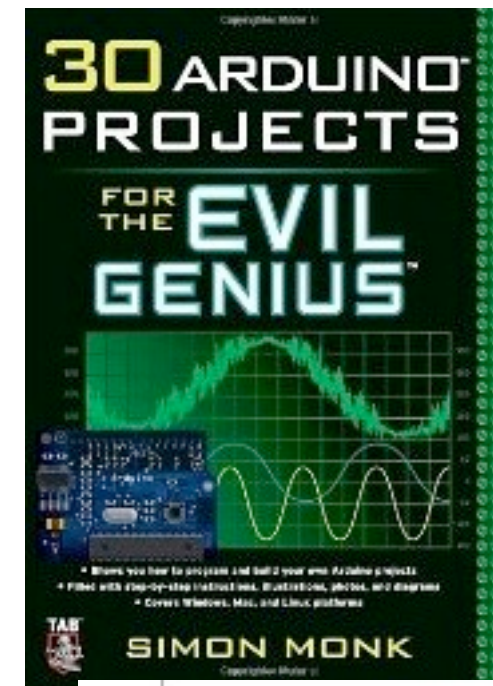
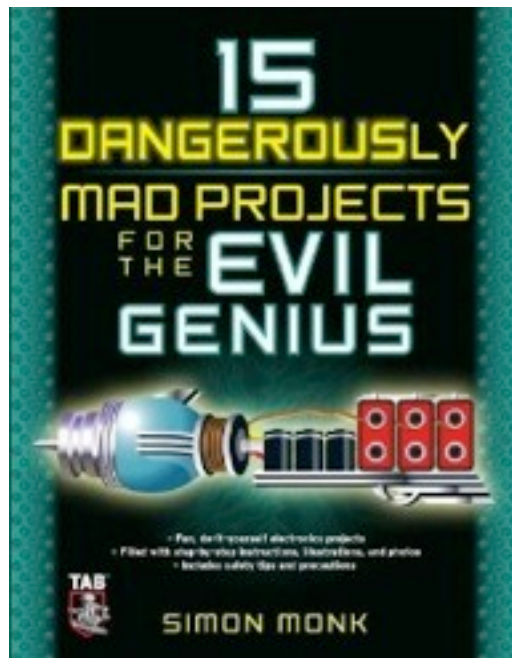
Raspberry Pi Meets Arduino

Simon Monk



Me

- Left 'Big Programming Job' to be:
- Author - OSH and Electronics

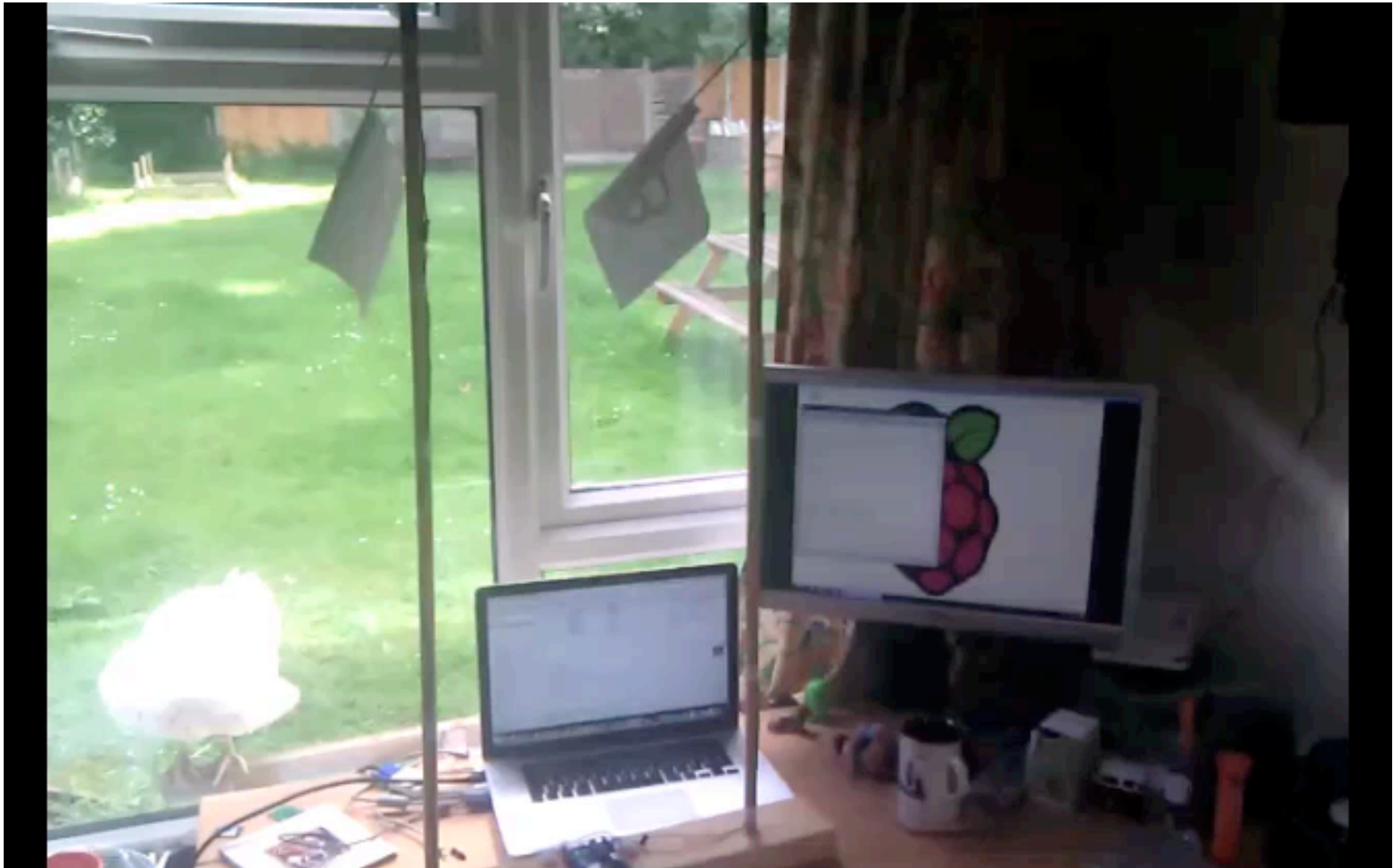


Objectives

- Understanding Open Source Hardware (OSH)
- Getting to know
 - Raspberry Pi
 - Arduino
- Understand why people buy them
- Understand what people do with them
- Why is 'Open' important

Demonstration

Demonstration

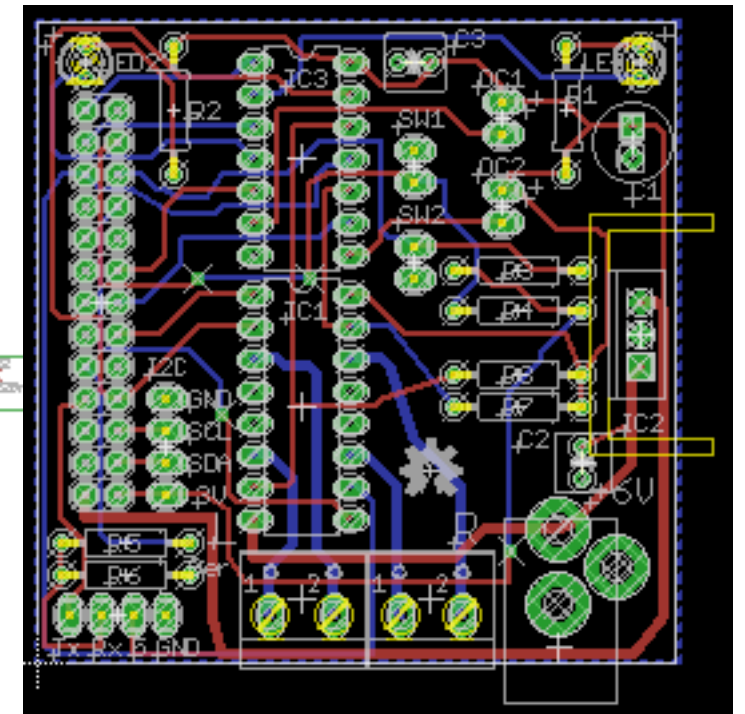
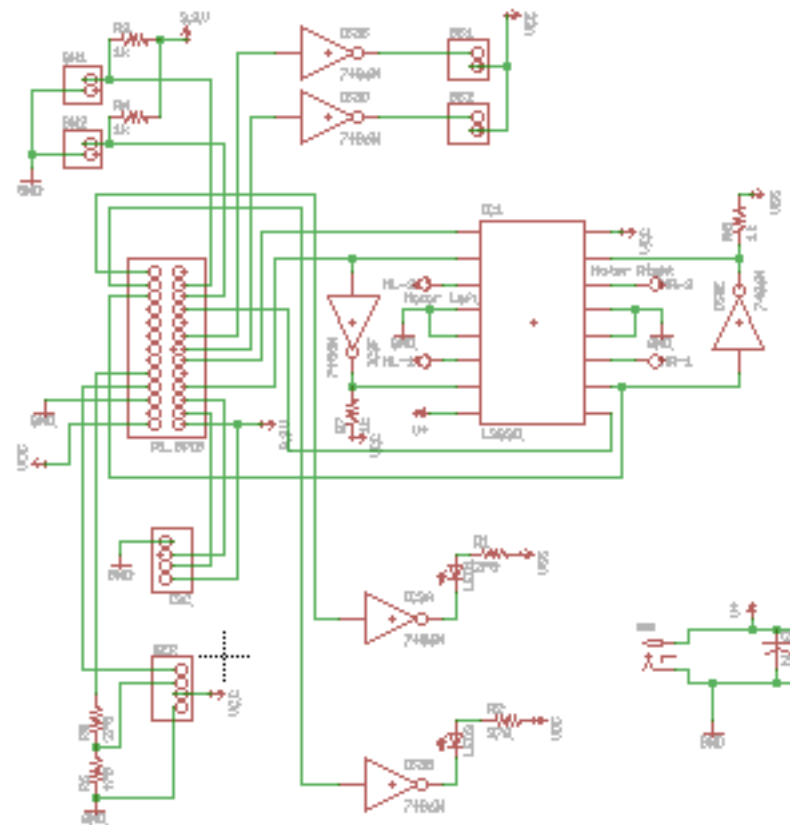


Significance

- Silly Project
- Why do people make these projects?
- How do people make these projects?

Open Source Hardware

- OSS-type of License
- Electronic Design Files
 - Schematic
 - PCB Layout
 - Firmware OSS
- Mechanical Design
- 3D models etc



Is it Really?



separated ground planes, plus an SMA connector and a 2.54mm spaced header available for RF output. The output impedance is somewhat high (you can't drive a speaker), so you may want to buffer the signal with an op amp.

Features:

- 10-bit DAC for good accuracy
- 2 frequency registers, plus a register-select
- 4 phase registers, plus 2 register select pins
- SPI communication with a simple command set
- Input voltage 6-9V
- Current consumption 5 to 40mA
- 5V SPI interface

Dimensions: 1.2"x1.0"

Weight: 0.15 ounces, 4.3 grams

Documents:

- [Schematic](#)
- [Eagle Files](#)
- [Datasheet](#)
- [App note](#)

Intellectual Property

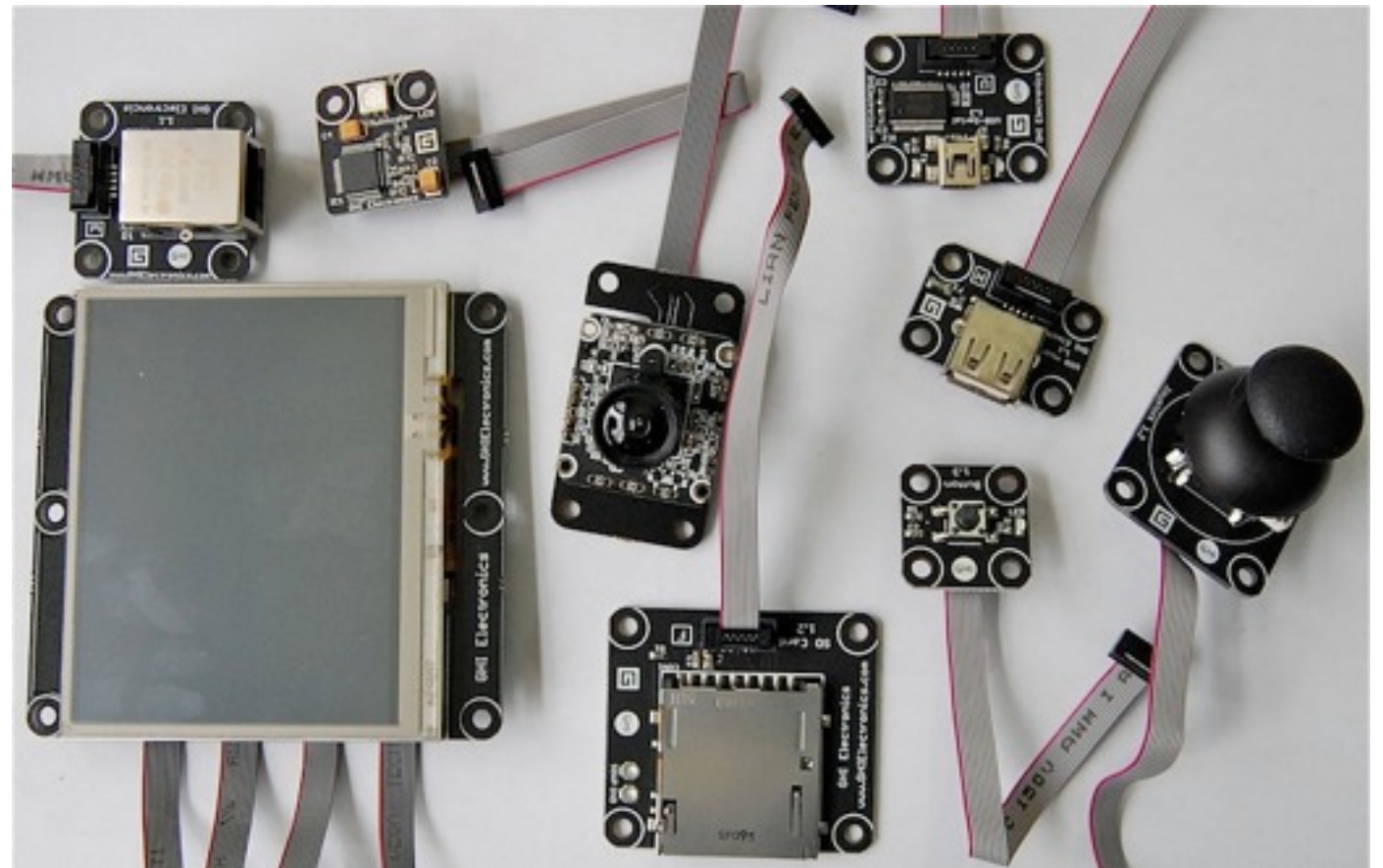
- First to market
- Community loyalty
- Keep the trademark release the design
- Sell Kits
- Sell training, consultancy, education

Why don't individuals make their own?

- They do, that's fine
- BUT
 - Its easier and probably cheaper to buy one made using economies of scale

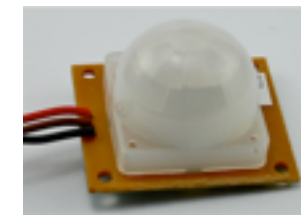
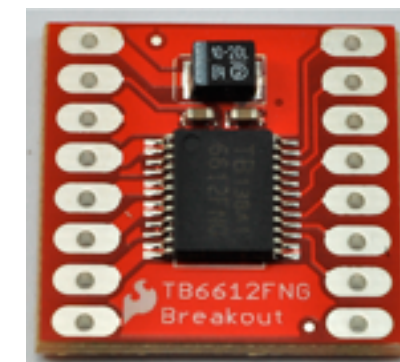
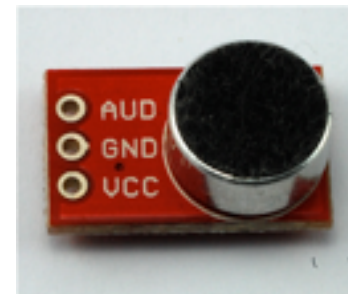
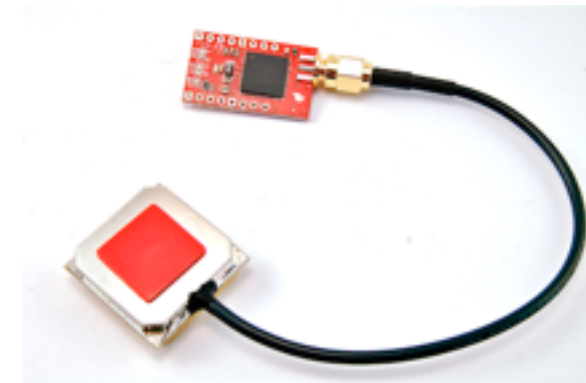
OSH Examples

- Microcontroller / Computer Boards
 - Arduino
 - Raspberry Pi
 - .NET Gadgeteer Boards (Even .NET on OSH)
 - BeagleBoard



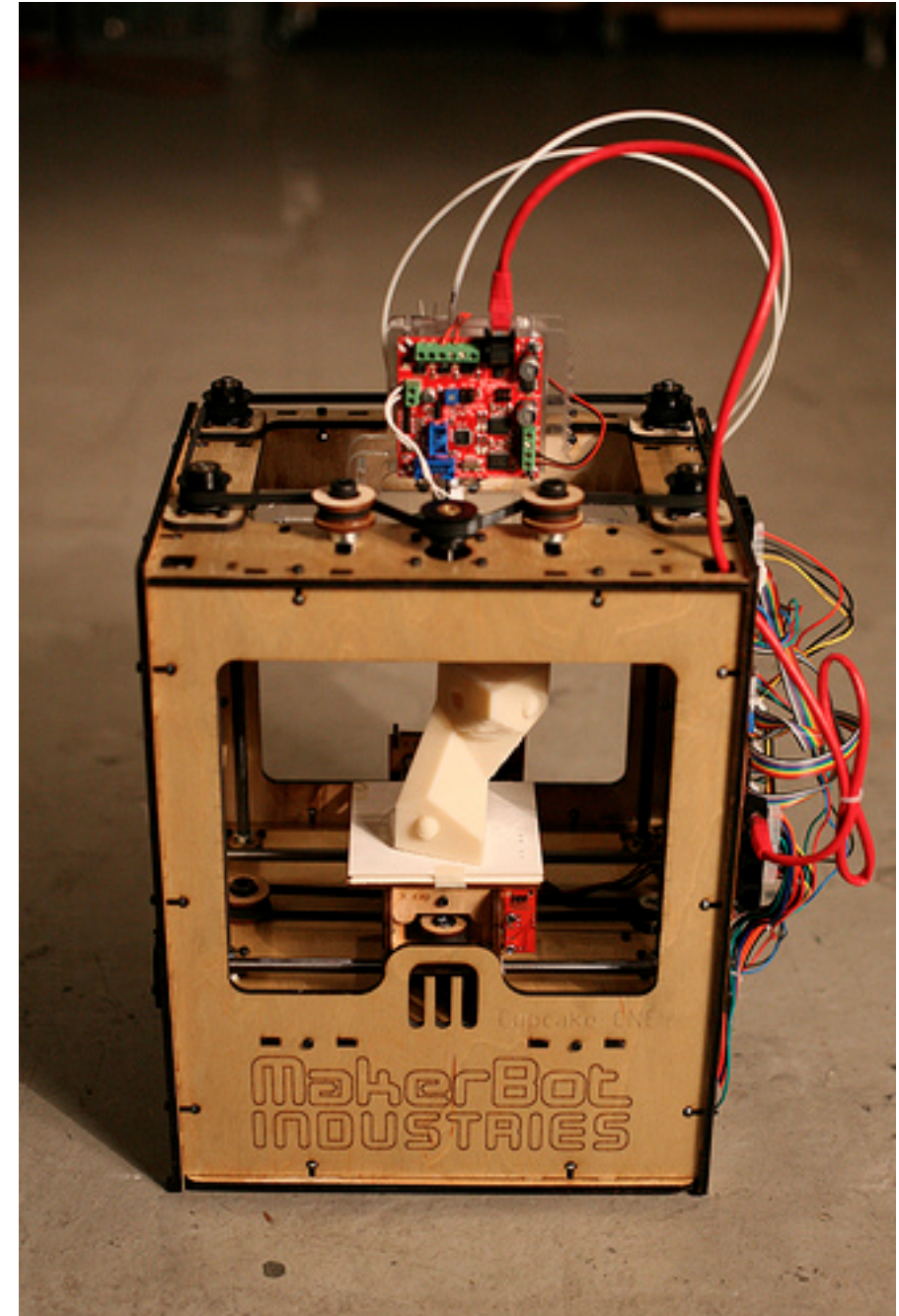
OSH Examples

- Modules
 - GPS
 - Microphone (Preamp)
 - Motor Drivers
 - PIR Sensor
 - etc.

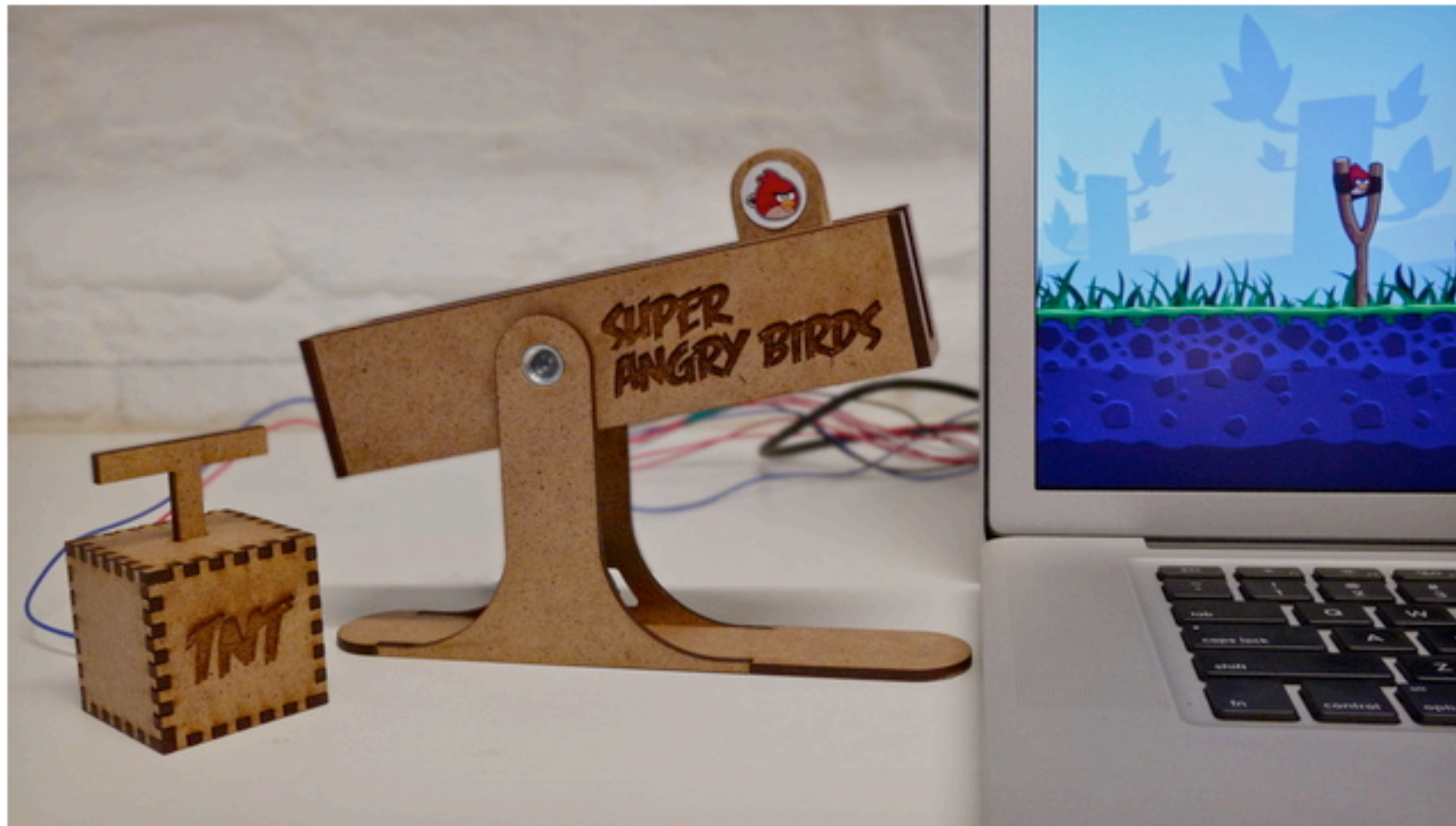


OSH Examples

- Tools
- RepRap - 3D printer
- Maker Bot - 3D printer
- Lasersaur - Laser cutter



DIY Projects



Hacking

Black Hat hacker gains access to 4 million hotel rooms with Arduino microcontroller

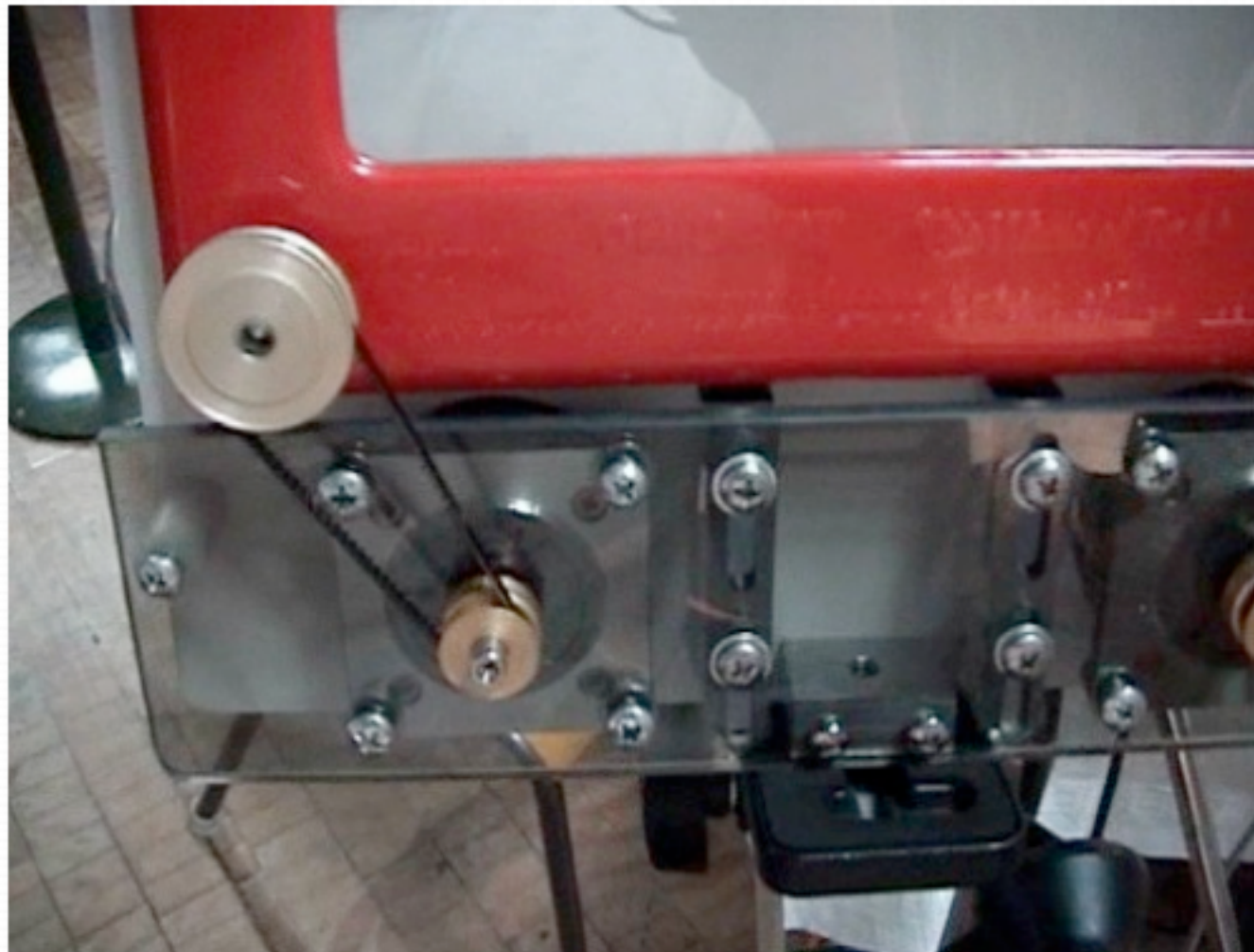
By Sebastian Anthony on July 25, 2012 at 7:00 am | [63 Comments](#)



Bubblino



Etch-a-sketch

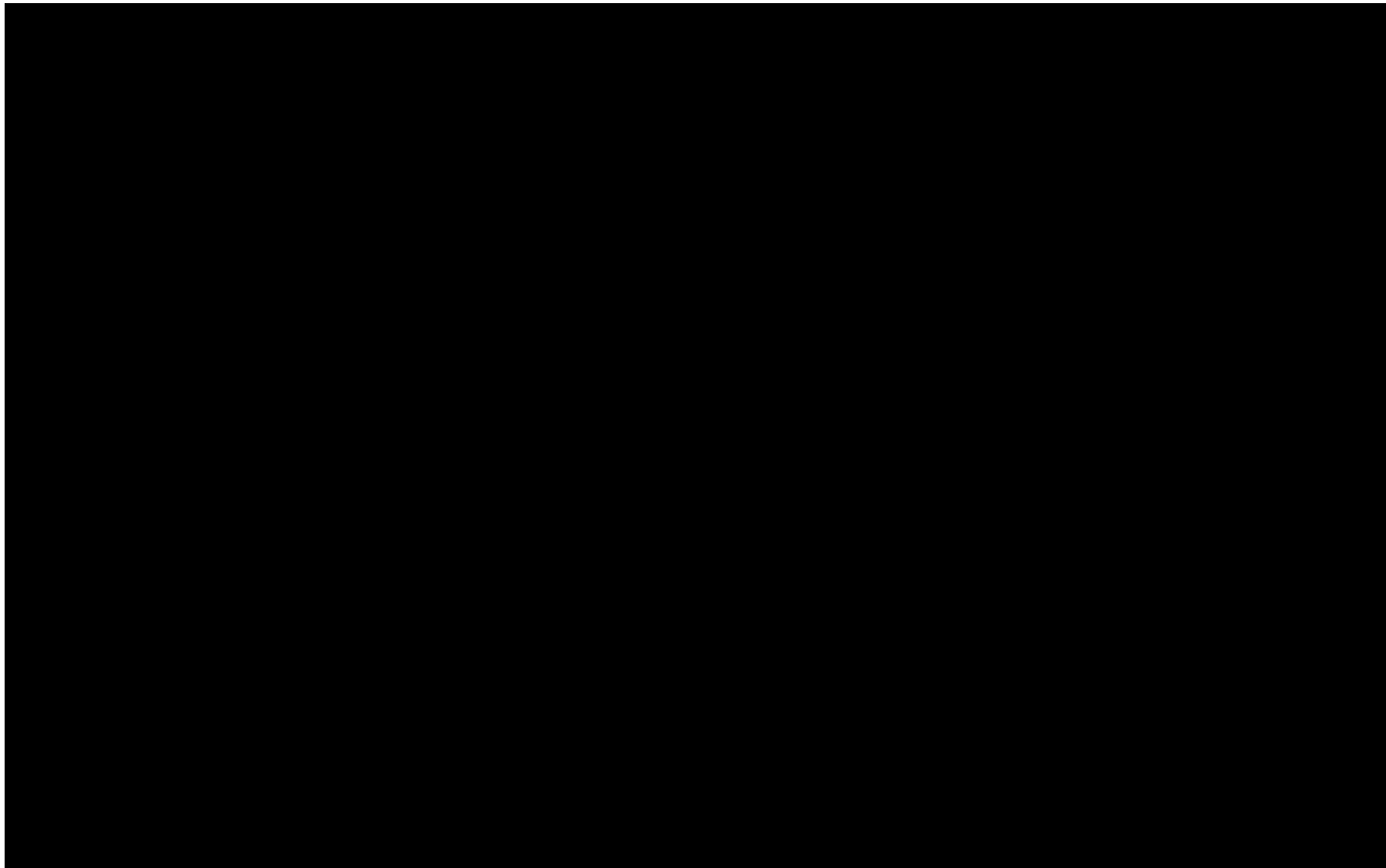


Global Show and Tell

- Instructables.com
- Hacknmod.com
- Youtube
- Blogs

One-Offs

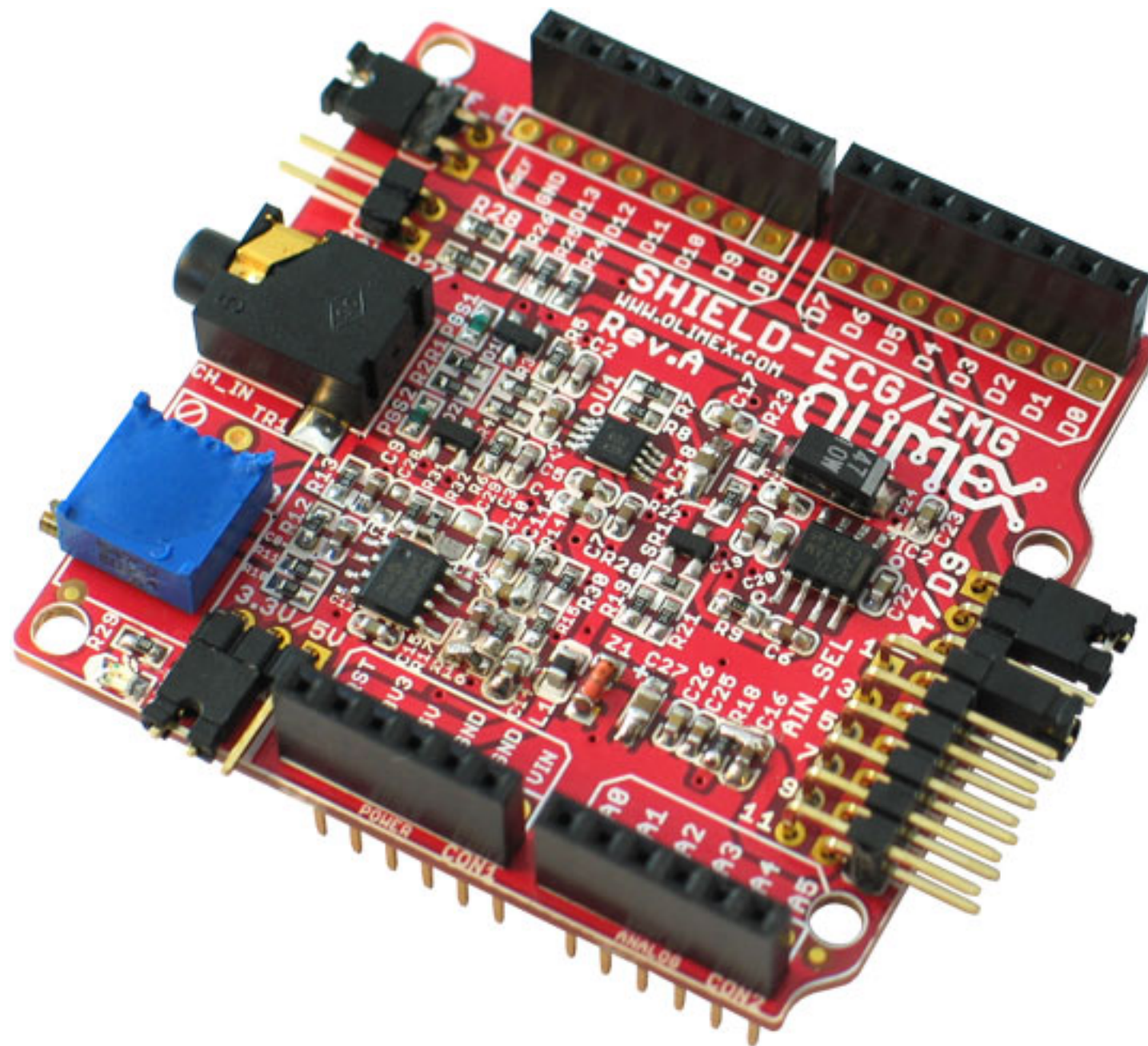
Hen-House Door



A black portable radio receiver is shown. It has a telescopic antenna extended to the left. The front panel features a large circular speaker on the left, a digital LCD display in the center-right showing "4 BBC R4 93.0" and "Batt 6.5V 3mA", and three small circular ports on the right. Two black knobs are located on top of the device. The radio is resting on a light-colored wooden surface.



Arduino ECG

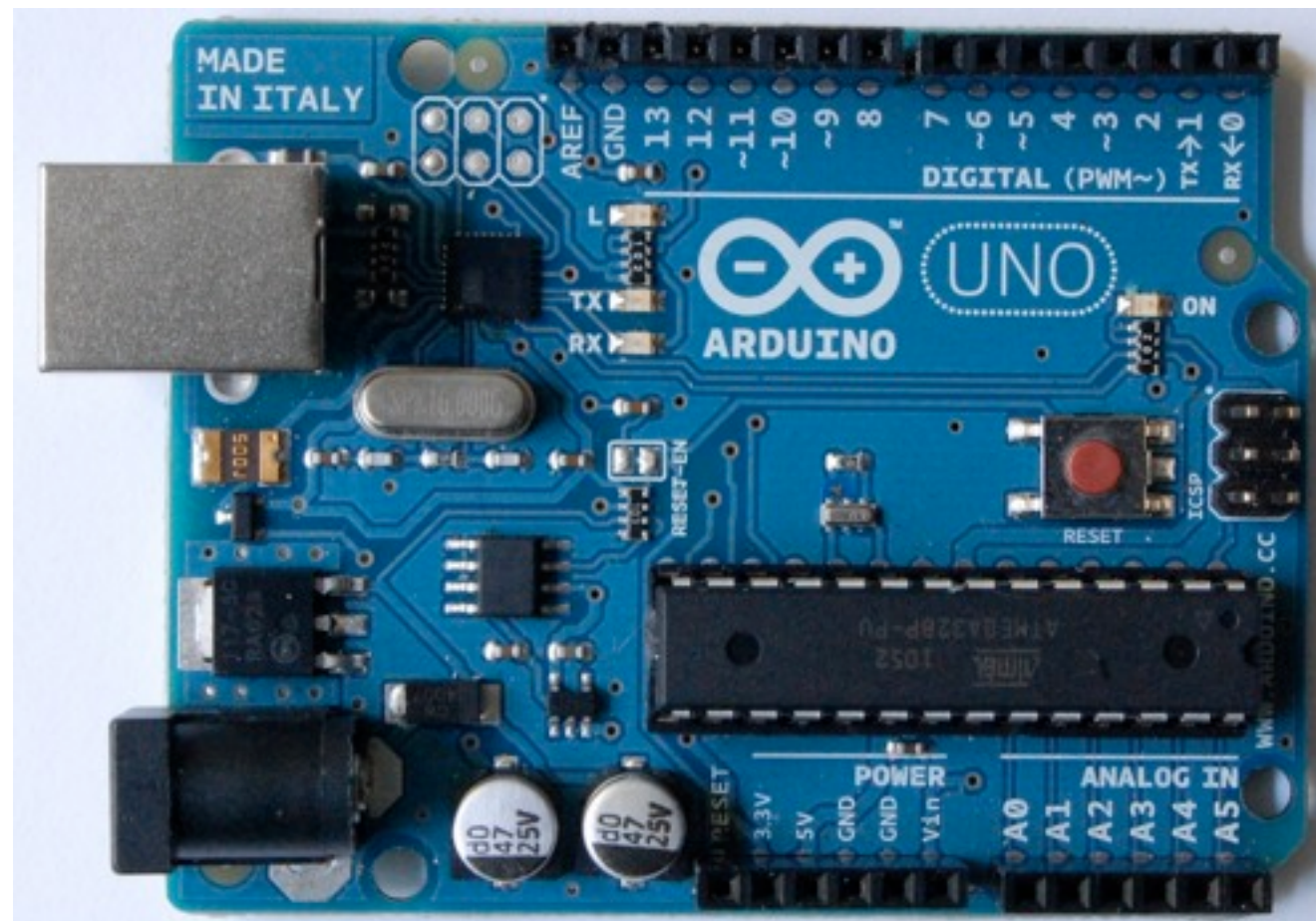


What is an Arduino?

Digital Inputs / Outputs


USB

Power



Analog Inputs

Arduino Software



The screenshot shows the Arduino IDE interface. The title bar reads "blink | Arduino 1.0". The toolbar contains icons for checking, running, saving, and uploading. A tab labeled "blink" is active. The code editor displays the following C++ code:

```
const int ledPin = 8;

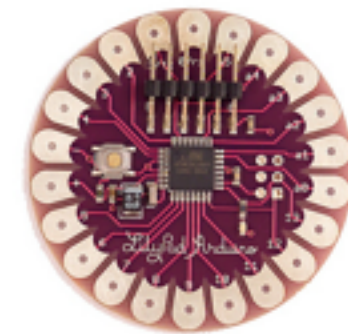
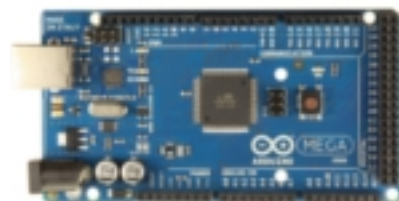
void setup()
{
  pinMode(ledPin, OUTPUT);
}

void loop()
{
  digitalWrite(ledPin, HIGH);
  delay(500);
  digitalWrite(ledPin, LOW);
  delay(500);
}
```

The line `digitalWrite(ledPin, HIGH);` is currently selected. Below the code editor, a status bar shows "Done uploading." and "Binary sketch size: 1026 bytes (of a 32256 byte maximum)". At the bottom, the terminal area displays "10" on the left and "Arduino Uno on /dev/tty.usbmodem621" on the right.

Types of Arduino

- Uno - most popular - all rounder
- Mega - more pins
- LilyPad - wearable
- Leonardo
- Mini
- Nano
- Bluetooth
- Pro Versions

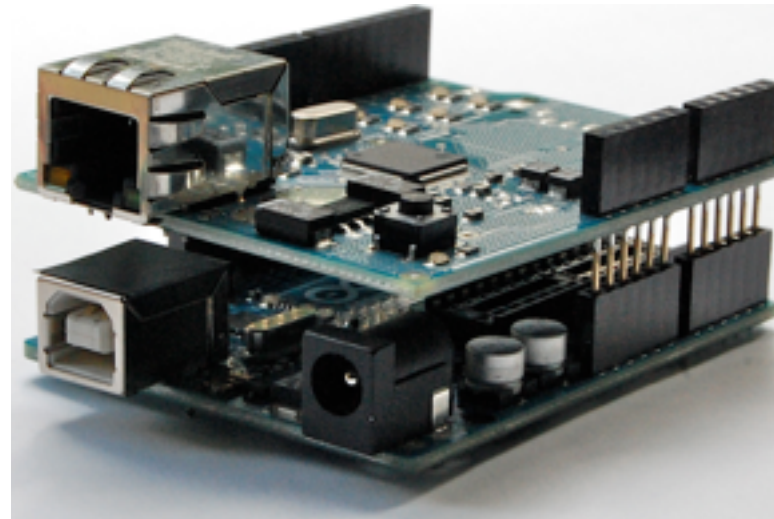


Other Types of Arduino

- Built-in Ethernet (EtherTen)
- Built-in USB Host (Electric Sheep, USBDroid etc.)
- Drone Piloting (ArduPilot)
- Lighting Control

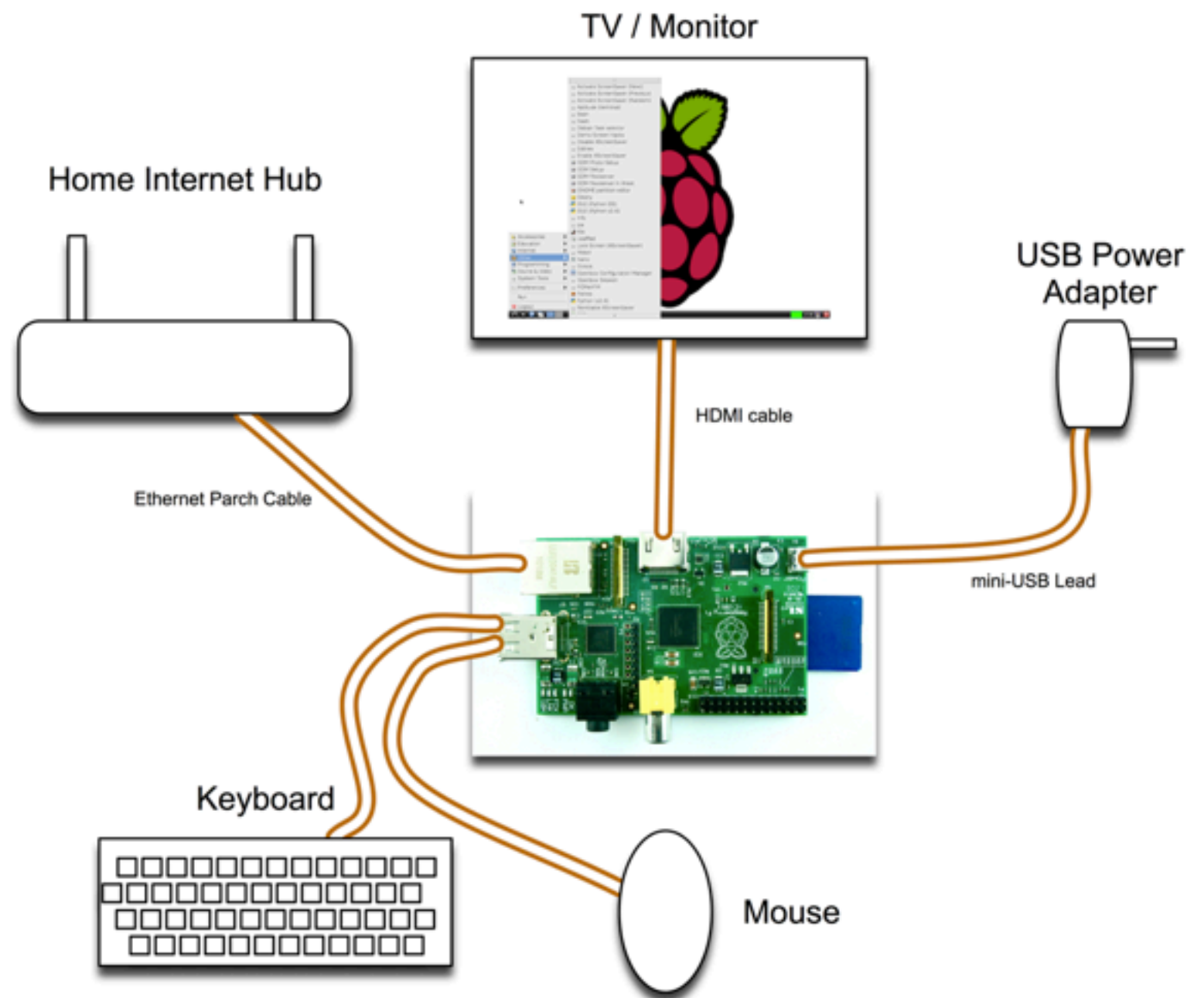
Shields

- Ethernet / WiFi
- Motor Driver
- Relay
- LCD Display
- USB Host
- Sensors
- etc.



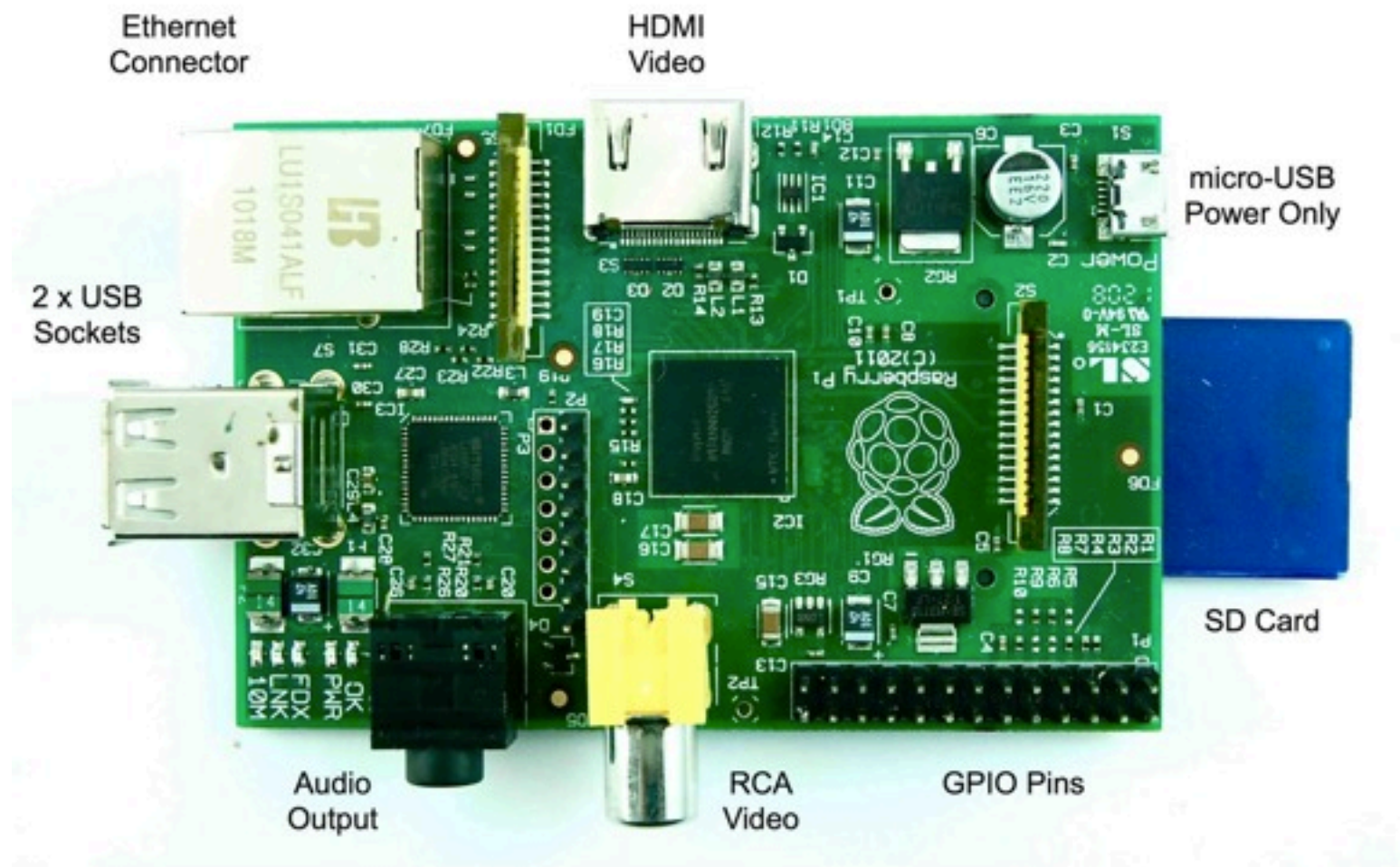
What is a Raspberry Pi?

- £30
- Debian Linux
- HDMI
- USB



Hardware

- 256 MB RAM
- 700 MHz
- BCM2835



Raspberry Pi Foundation

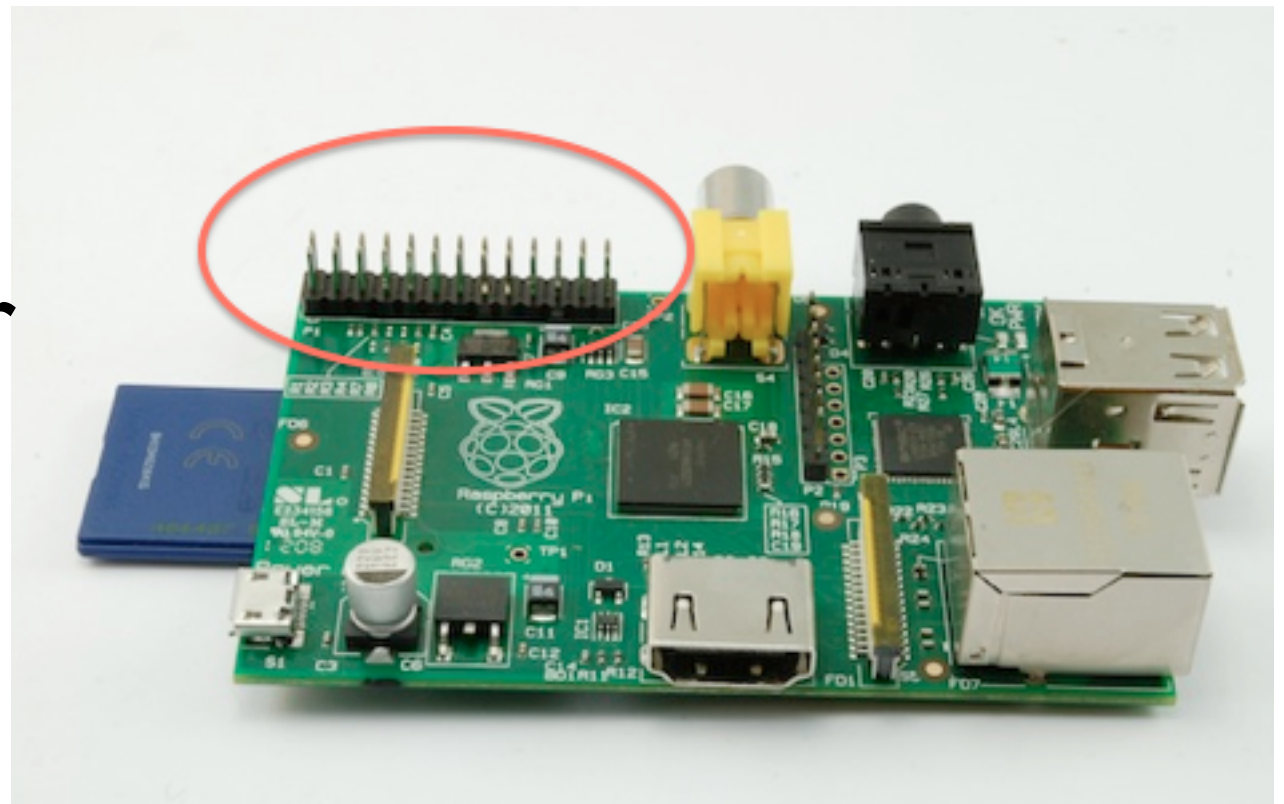
- Not-for Profit Organisation
- Cambridge University
- ‘A Computer to Inspire Children’ - Like the BBC Computers
- ‘Burn Through’ the consumer market first

Programming Pi

- Python
 - Tkinter - GUIs
 - PyGame - Games
- Scratch - Visual Programming
- Java, Clozure CL, Squeek, LAMP!

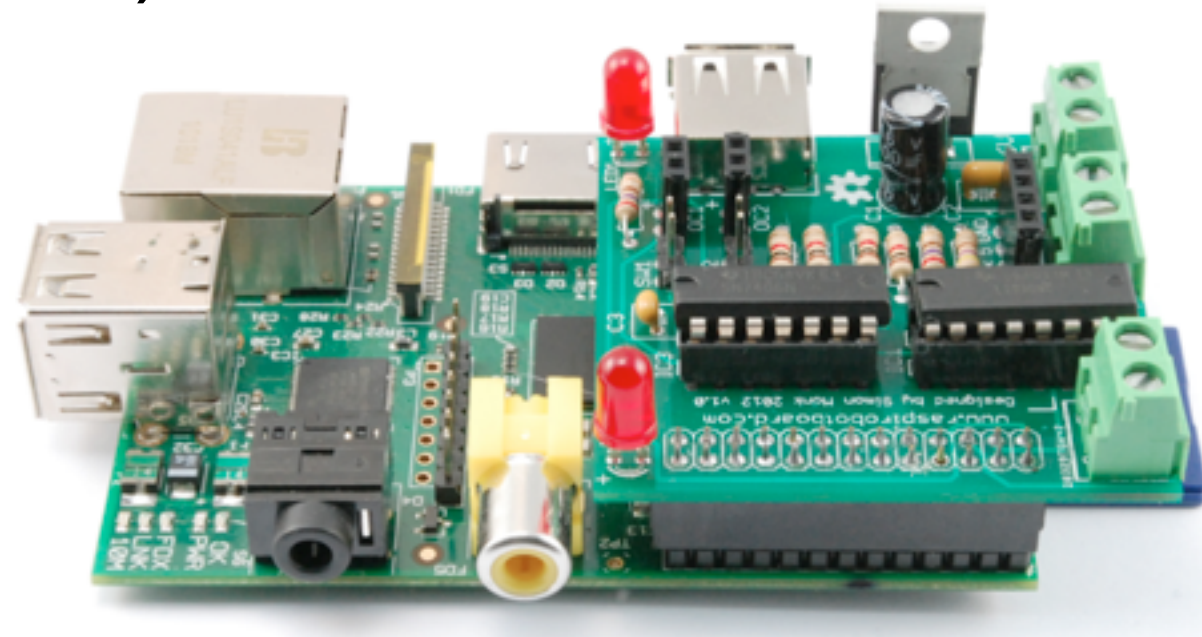
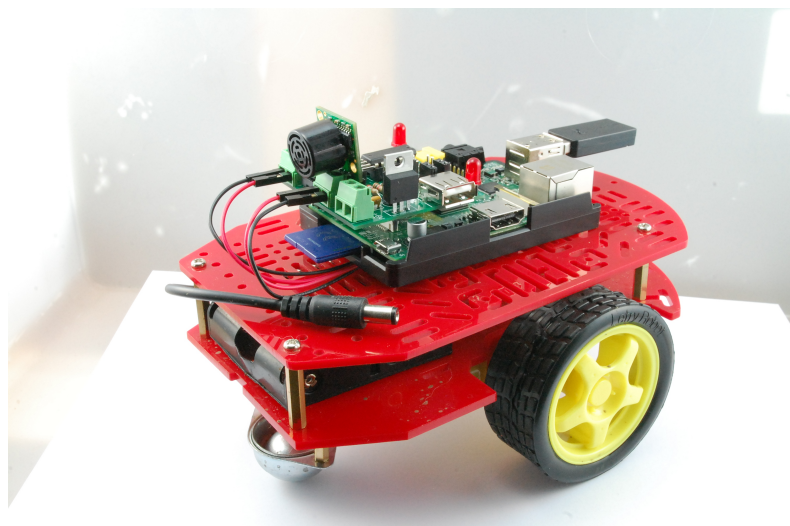
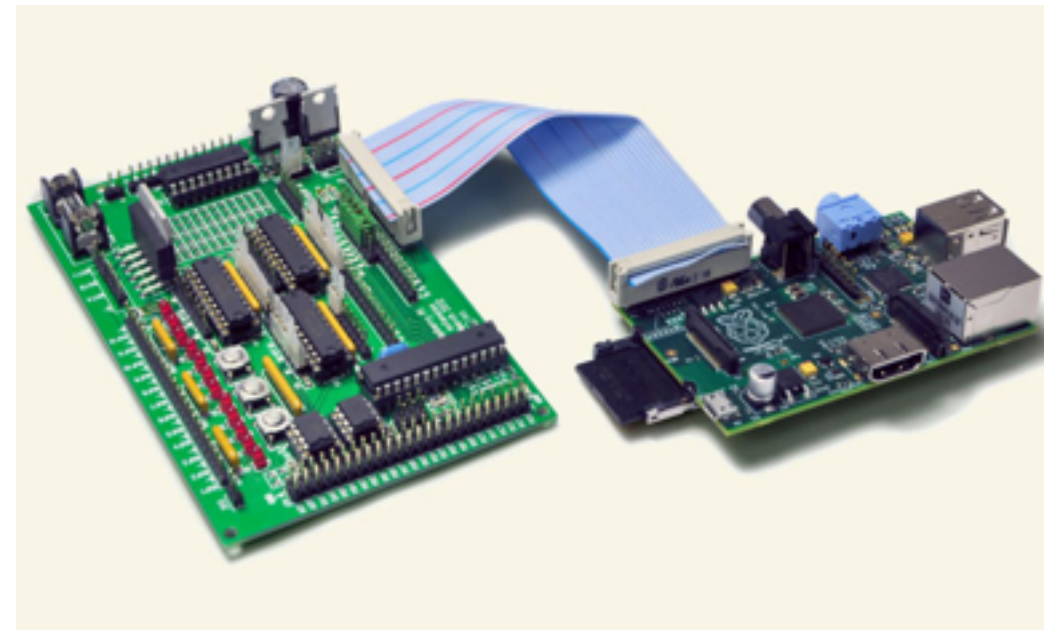
Pi Expansion

- GPIO Connector
- I2C
- Serial
- General Purpose IO Pins



Pi Expansion Boards

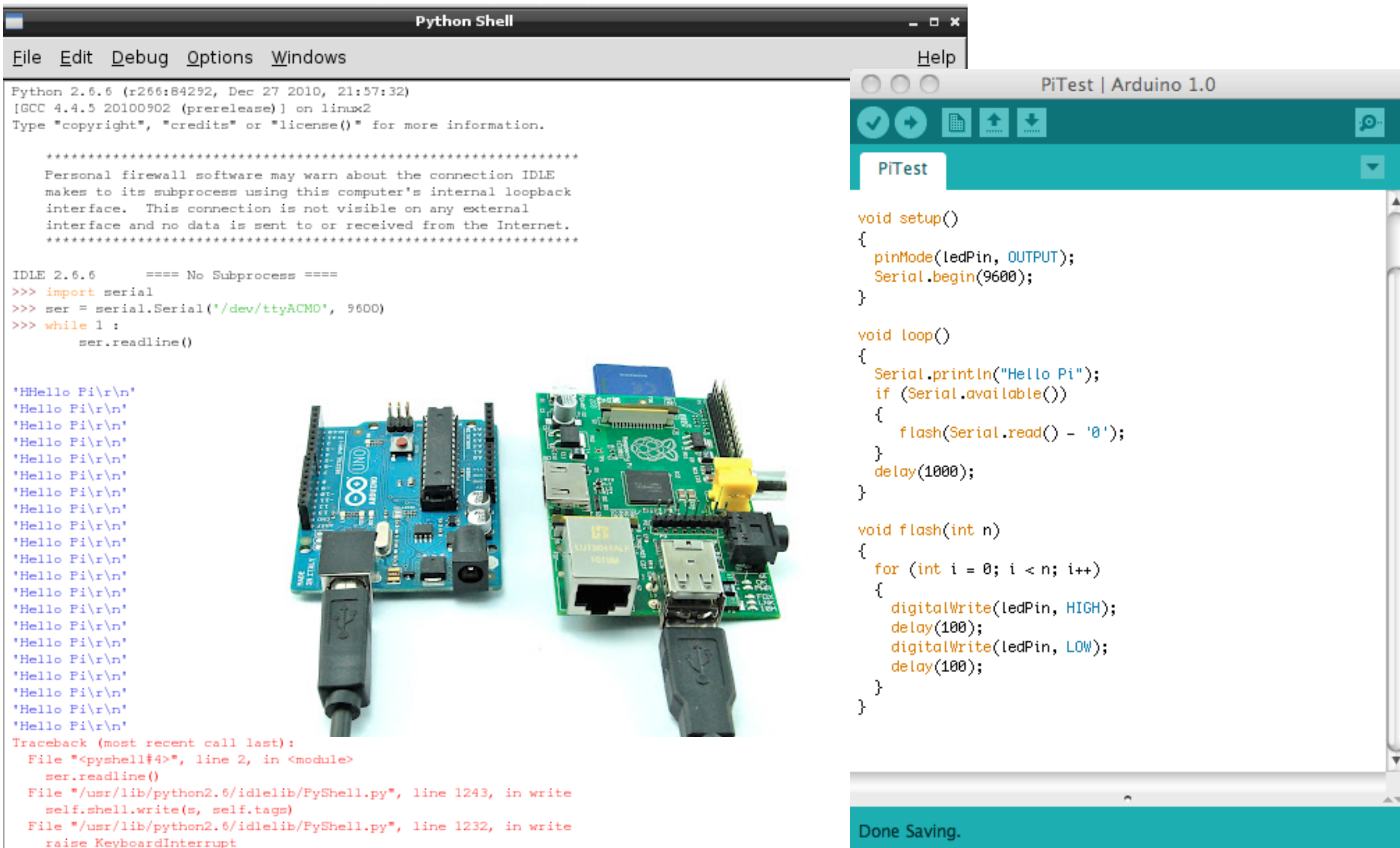
- Like Arduino Shields
 - Gertboard
 - Pi Face
 - RaspiRobotBoard (Nov)



Pi is not Arduino

- Linux - Not a Real-time OS
 - Timing unpredictable
 - Not good for
 - Servos, PWM
 - Pulse measurement
- No Analog Inputs
- Low current (delicate) GPIO pins
- 500mA vs 50mA

Arduino & Raspberry Pi



Summary

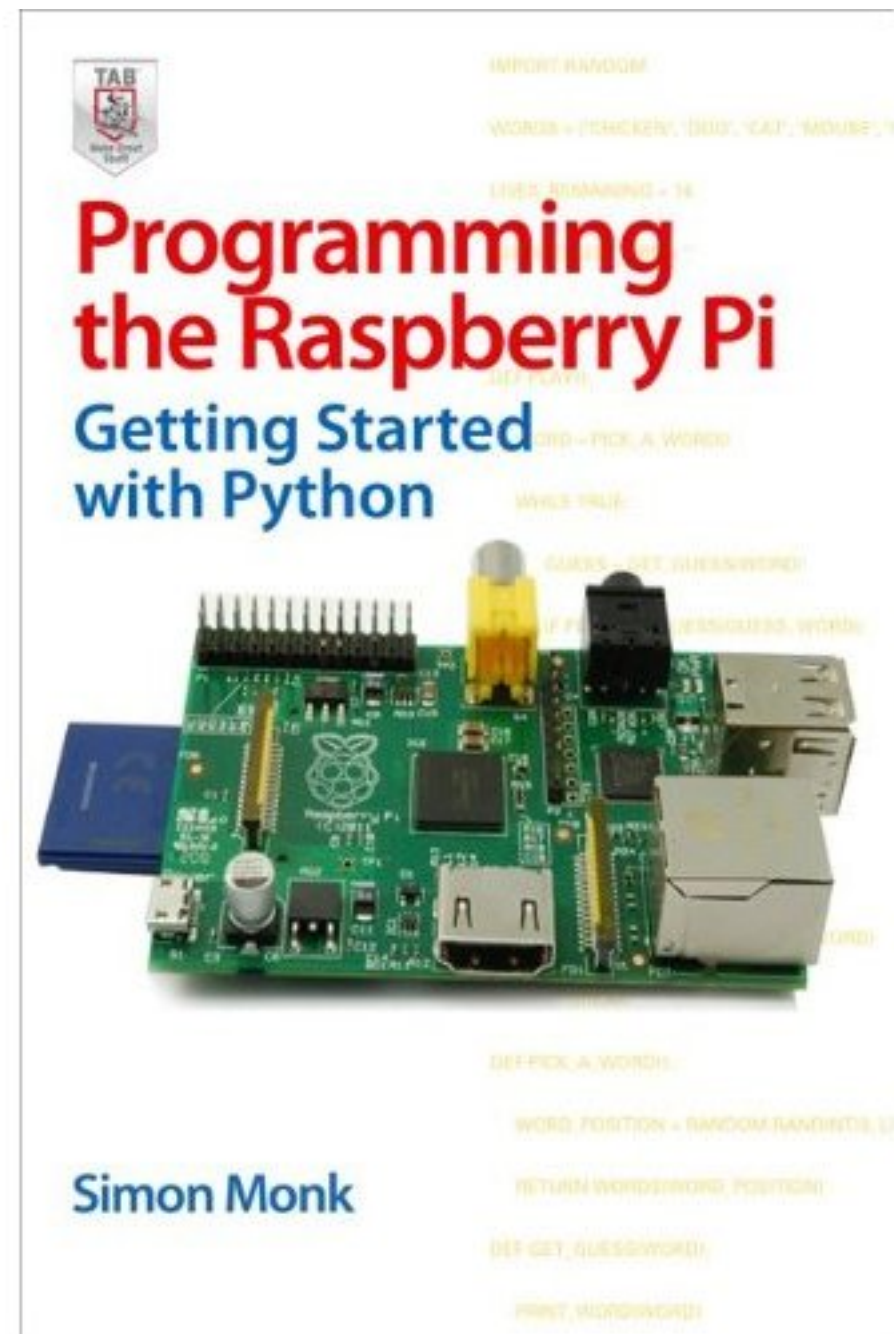
- OSH - Driving a wave of creativity and invention
- Raspberry Pi - The computer bit (but can do some electronics)
- Arduino - Microcontroller Board, good with electronics
- Combine as alternative to expansion board

Shopping

- Arduino Uno - £25
 - Maplin's
 - CPC, Farnell, eBay
- Raspberry Pi - £30
 - CPC, Farnell, RS Components
- OS Hardware Modules
 - Sparkfun.com
 - Adafruit.com
 - Proto-pic.co.uk (Scotland)

Plug

- Raspberry Pi Book, Out in November 2012
- Amazon Etc.



Contact

- Twitter: @simonmonk2
- Web: www.simonmonk.org
- Email: evilgeniusauthor@gmail.com
- Blog: www.doctormonk.com