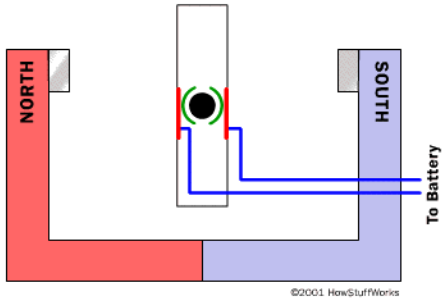
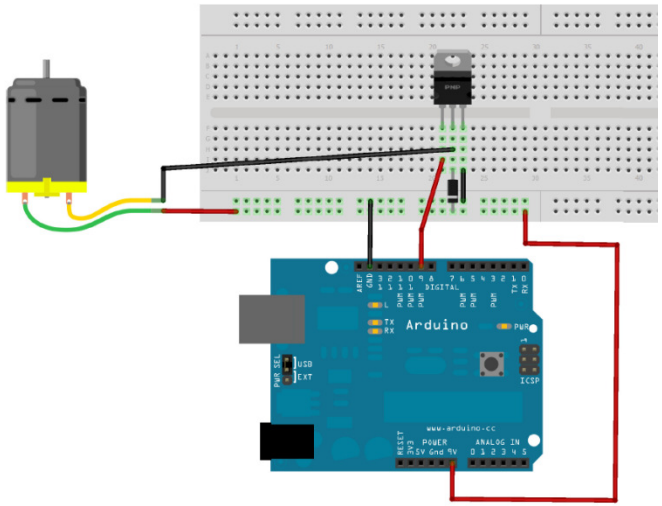
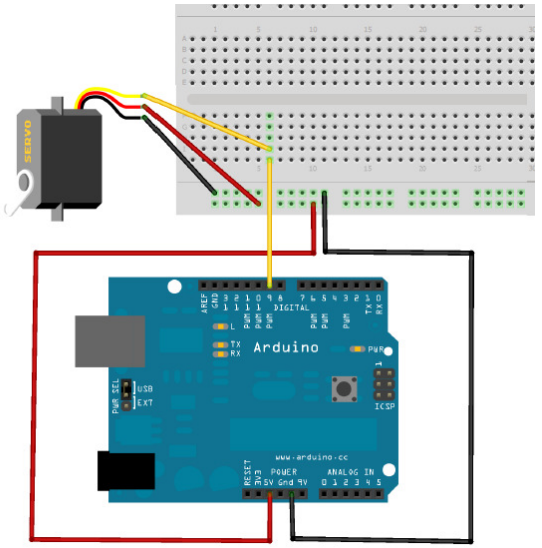
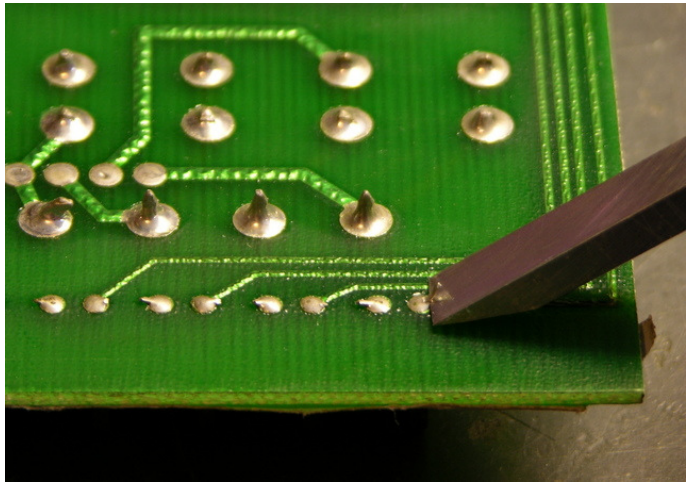

NORTH
SOUTH
To Battery
©2001 HowStuffWorks

Last time…


Arduino


Arduino



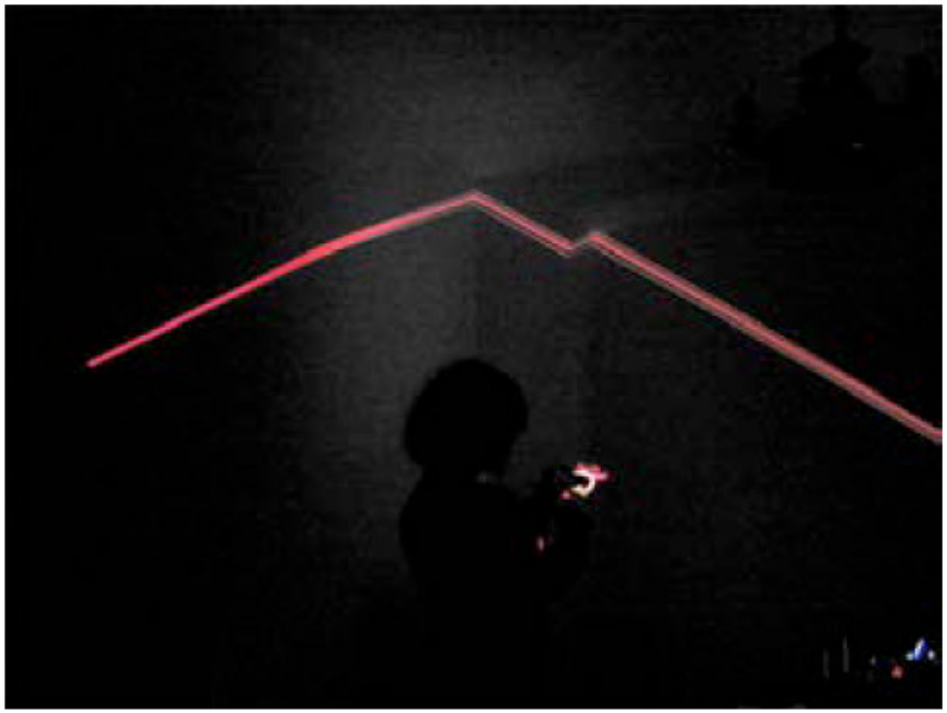
Reusing Electronics…

Low-tech sensors

Hacking

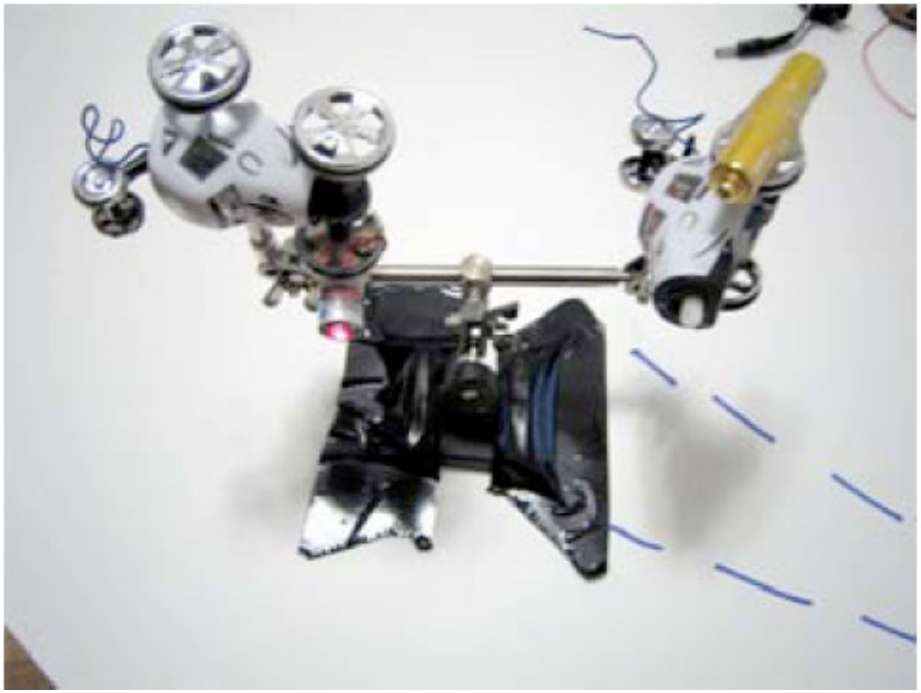
http://lowtech.propositions.org.uk/

Space Mapping Laser



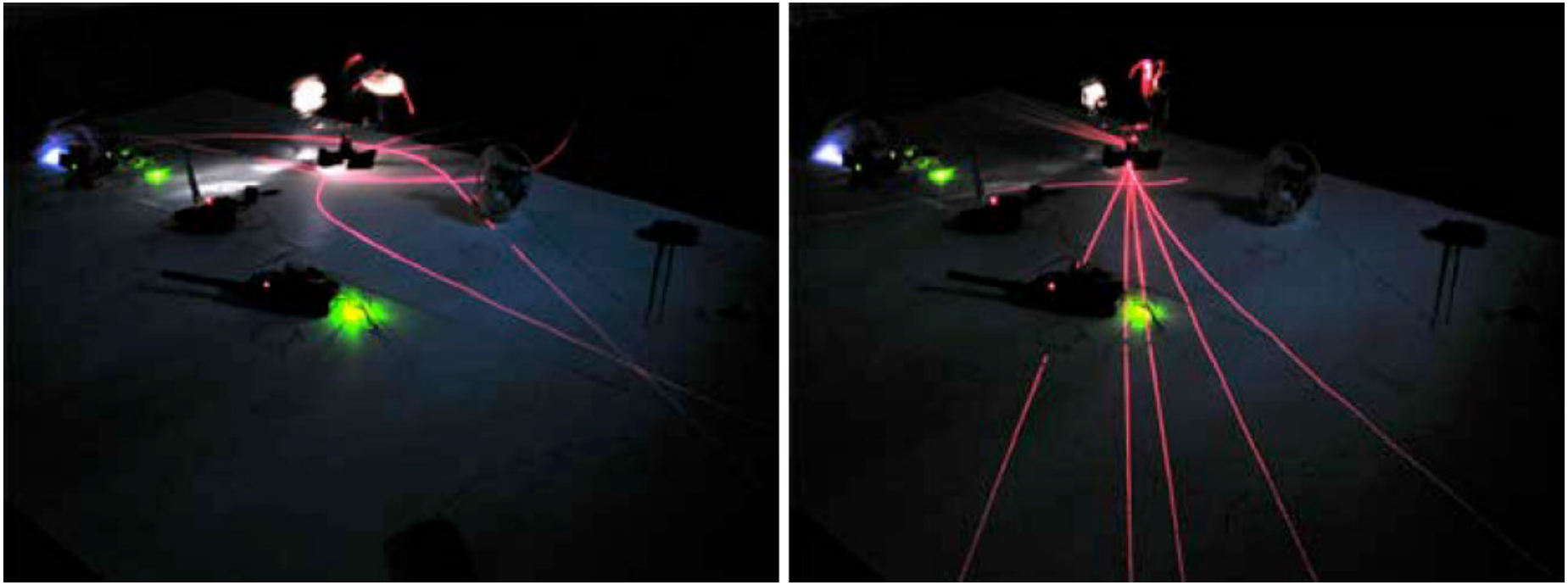
Fast rotating laser can draw perfect planes to expose complex shapes at corners

Making…



- A laser is mounted on a RC car, a wheel is fixed and is signaled to move forward.

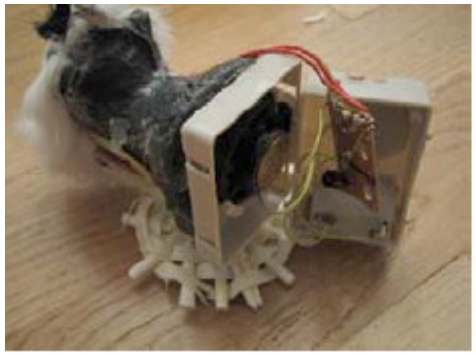
Resulting laser plane lines…



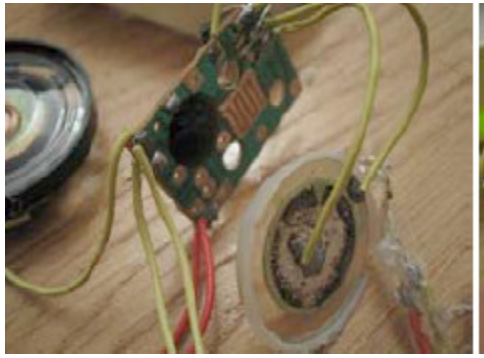
- Complex geometries are formed by simple laser spin

Low-tech sensors




Making any project responsive to sound…




Ubiquitous Objects…

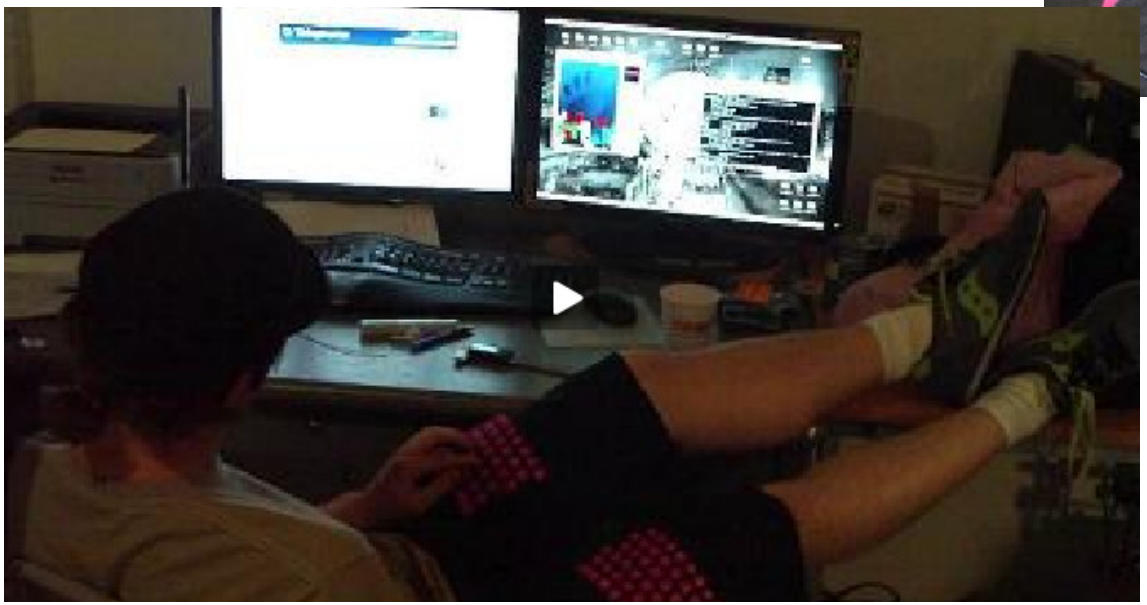
Which daily used object can be used if we need to take many inputs…

Hacking a keyboard!

- How it works?
- How it can be reused?

Hacking a keyboard!

- How it works?
- How it can be reused?



Ripping Electronics apart!!!

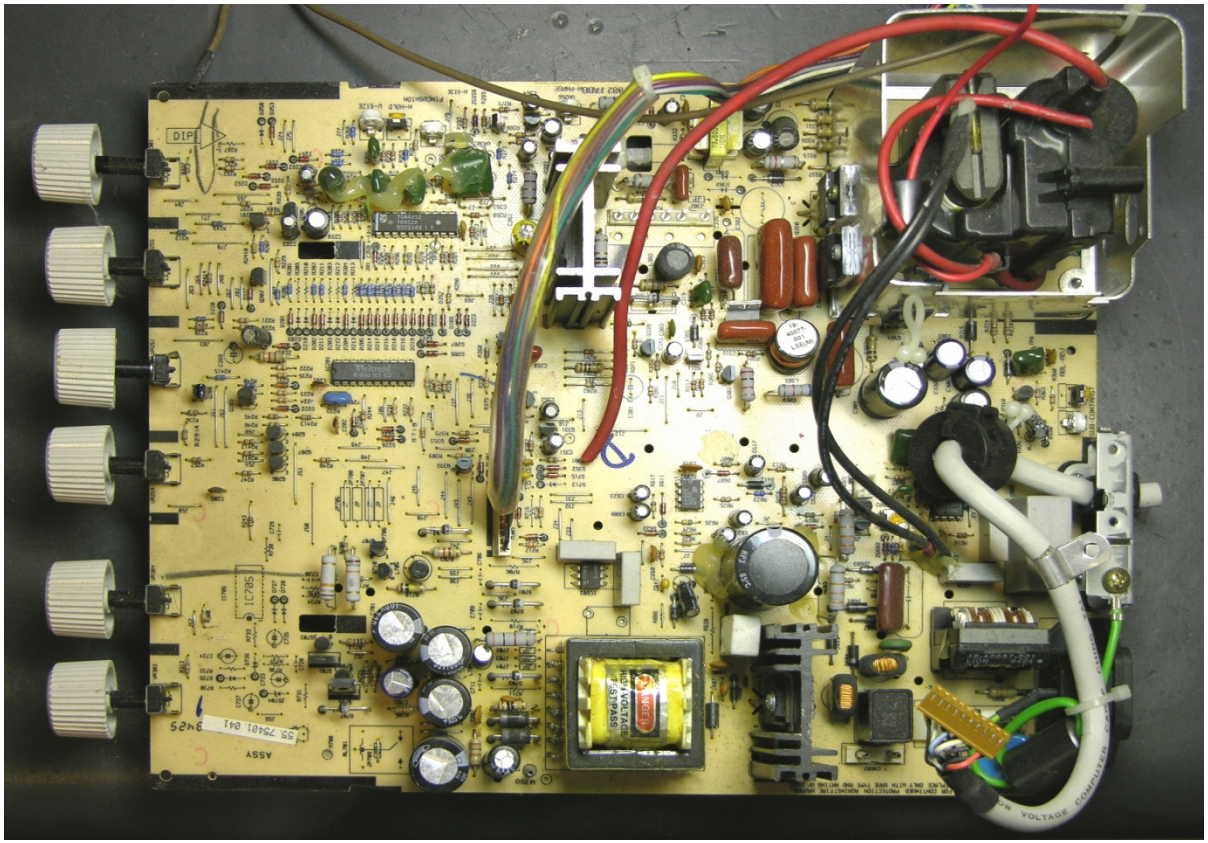
WHY???

- Get many electronic parts for a cheaper cost.

- Only efficient way to reuse old electronics which can work for you instead of being tossed out.

Electronic Components…

CRT computer monitors:



Resistors

Small-signal diodes

Capacitors

Potentiometers

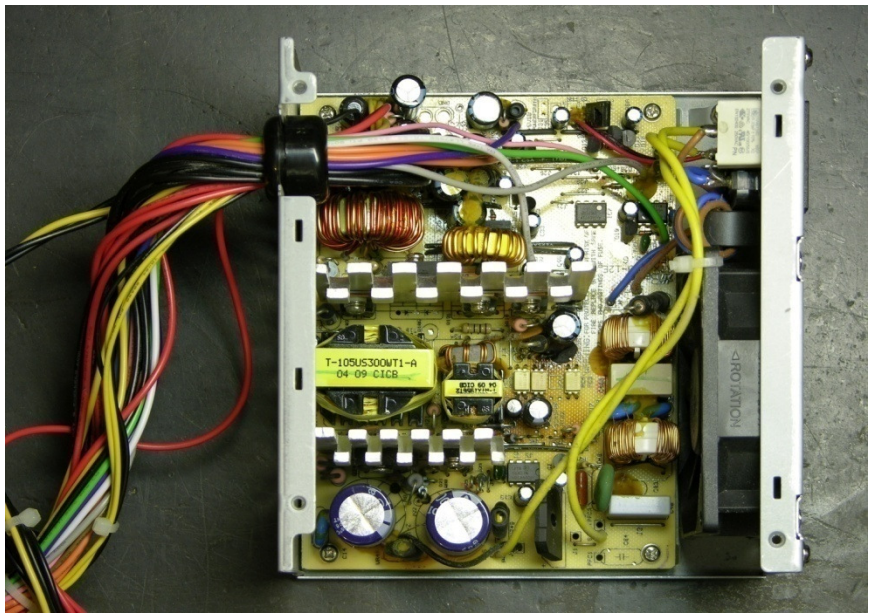
Push Button Switches

Source: Keith's Electronics Blog (http://www.neufeld.newton.ks.us/electronics/)

Electronic Components…

Dot-matrix impact printers / Inkjet printer:
Resistors, Stepper driver chips, Stepper motor

Dead PC power supplies:
1 ft 18-gauge stranded wire of different colors, Electrolytic capacitors, rectifier diodes



External Modems:
Resistors, Capacitors, Leds

Source: Keith's Electronics Blog (http://www.neufeld.newton.ks.us/electronics/)

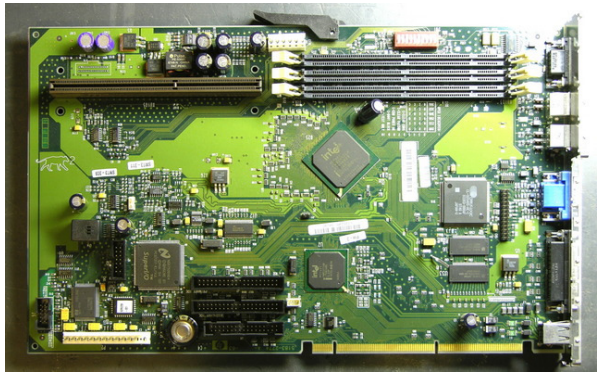
Electronic Components…

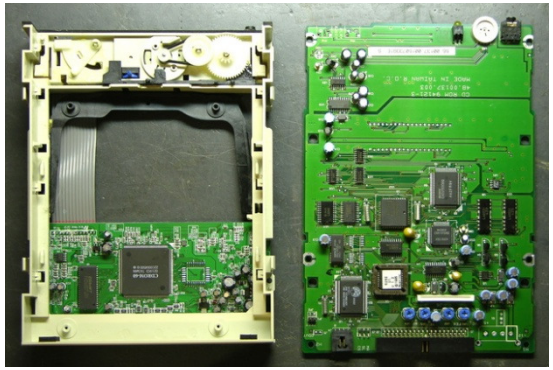
Computer Motherboards:

Battery Holder, Jumpers, SMT resistors

Dead CD-ROM and hard drives:

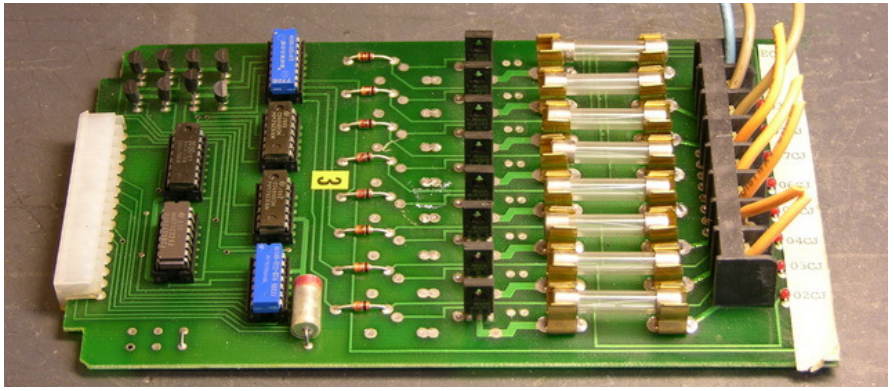
DC / stepper motors, tiny limit switches



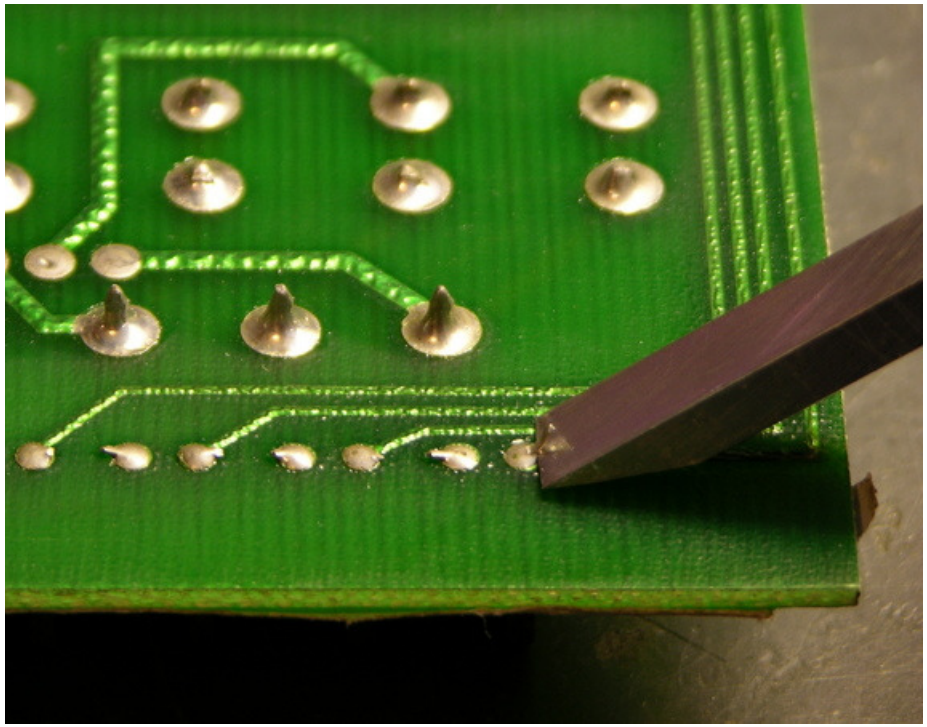


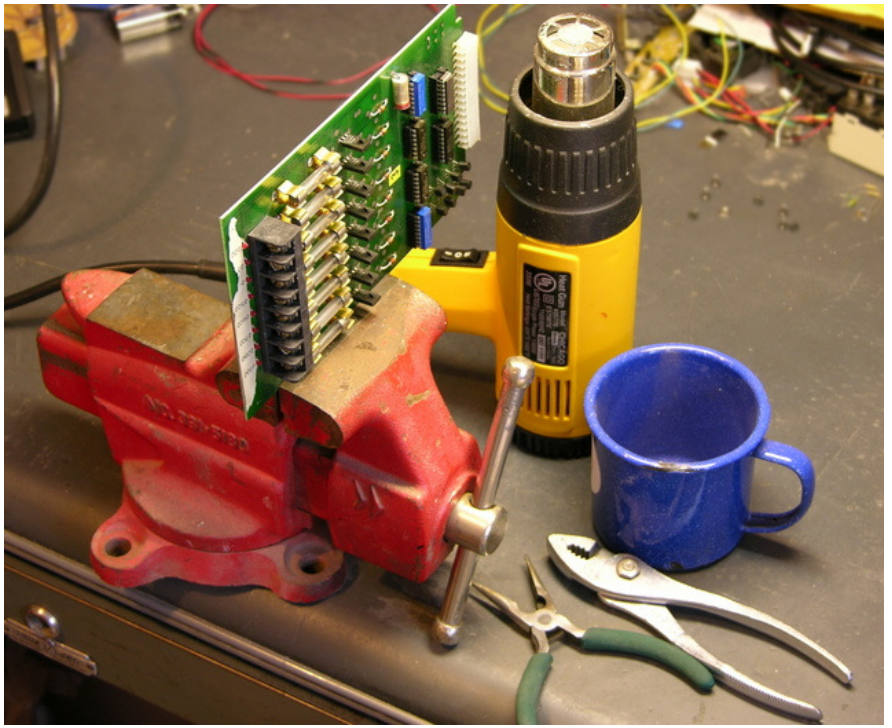
Source: Keith's Electronics Blog (http://www.neufeld.newton.ks.us/electronics/)

Procedure…



- **Uncrimping Component Leads**

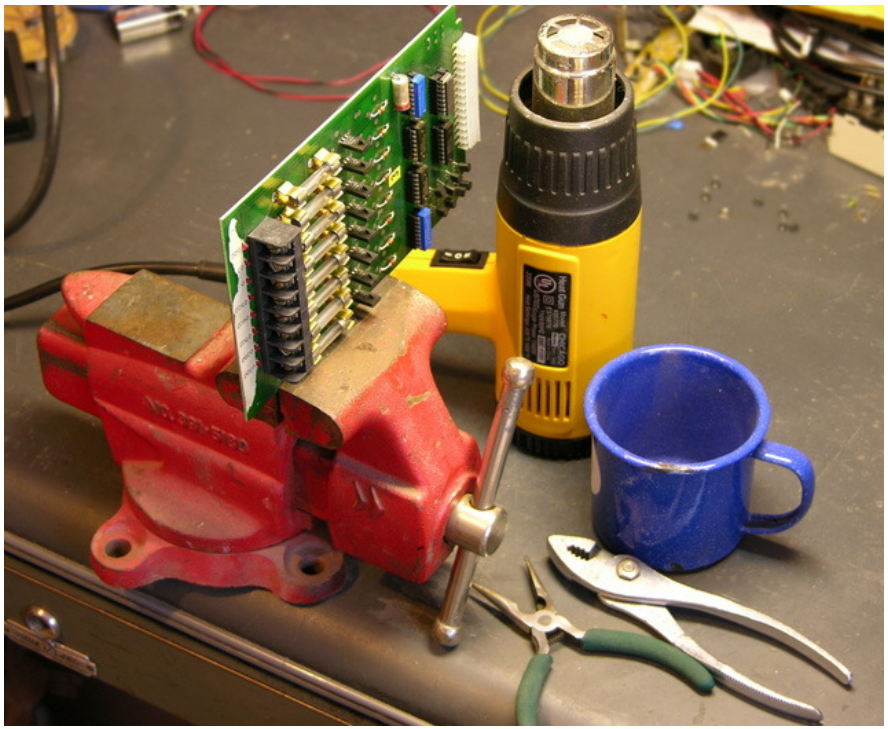


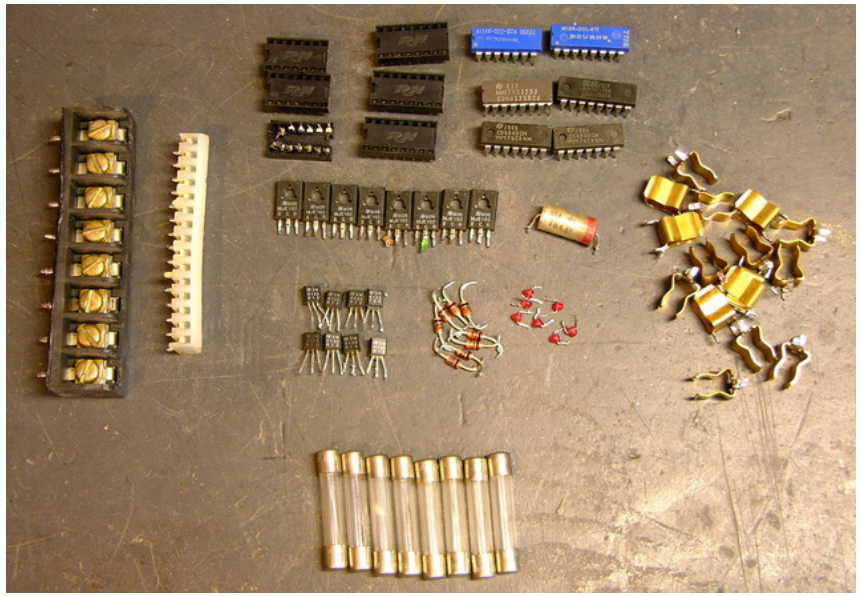


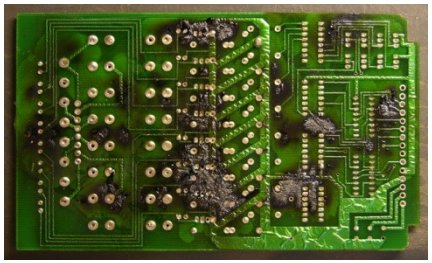
Source: Keith's Electronics Blog (http://www.neufeld.newton.ks.us/electronics/)

Procedure…

- **Heating and Removing Components**
- Work bottom up…solder goes down
- HOT!!! Careful.
- Pliers to pull components







Source: Keith's Electronics Blog (http://www.neufeld.newton.ks.us/electronics/)

Interrupts…

Interrupts Intro…

Say we are making a robot which goes straight until its proximity to an object is influencing its angle.

Code:

```
GoForward();
While(sensorvalue == HIGH) {
    doSomething();
}
```

Interrupts Intro…

Code:

```
GoForward();
While(sensorvalue == HIGH) {
        doSomething();
}
```

Loop Holes of this code:

if “doSomething” code has a lot of things to do…

if sensorvalue changes for a split sec and we want to track this change…

Where Interrupts are used…

Interrupts does same as the code… without much work for the microcontroller.

- Counting pulses from an encoder (they are really short, and come very often)
- Catching some short pulse (like the 10ms pulse given off by a UVTron sensor)
- Using switches or digital IR sensors as bumpers (and you want an instant stop)

Interrupts are…

Microcontrollers have options like PWM, analog to digital convertors and Interrupts.

When interrupts is triggered things happen:

- Stops the running program.
- Runs the interrupt program.
- Restarts the running program.

Using Interrupts…

Interrupts can be run if there are any changes in the designated interrupts PIN.

ARDUINO has 2 interrupt pins…

- 0 interrupt pin **...** corresponding to digital PIN2
- 1 interrupt pin **...** corresponding to digital PIN3

Arduino : Interrupts…

Calling interrupt function in arduino…

AttachInterrupt(interrupt, function, trigger);

Interrupt : PIN0/1 :digital 2/3
Function: function to run during interrupt
Trigger:

LOW:	when signal is low
CHANGE:	any change in signals
RISING:	goes low to high
FALLING:	goes high to low

Time functions in interrupts

System clock works of interrupt.

If one interrupt is working it halts other all interrupts…

So when arduino interrupt is running the function it halts system clock.

This is a problem as you cannot use time dependent functions: delay, millis, serial data

Different interrupt functions

AttachInterrupt(interrupt, function, trigger);

detachInterrupt(interrupt)

noInterrupts()

interrupts()

```
void setup() {}
void loop() {
noInterrupts();
// critical, time-sensitive code here
interrupts();
// other code here }
```

Advanced : need more interrupt pins?

The pins are given different number compared to digital pin numbers. So this needs to be checked in datasheet before assigning.

Few references:

http://forums.trossenrobotics.com/tutorials/how-to-diy-128/an-introduction-to-interrupts-3248/

http://www.arduino.cc/cgi-bin/yabb2/YaBB.pl?num=1193225679