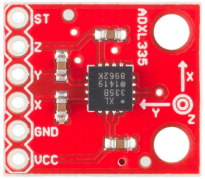
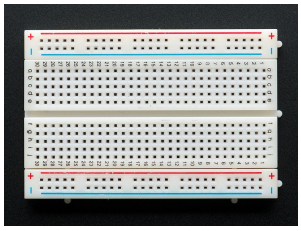
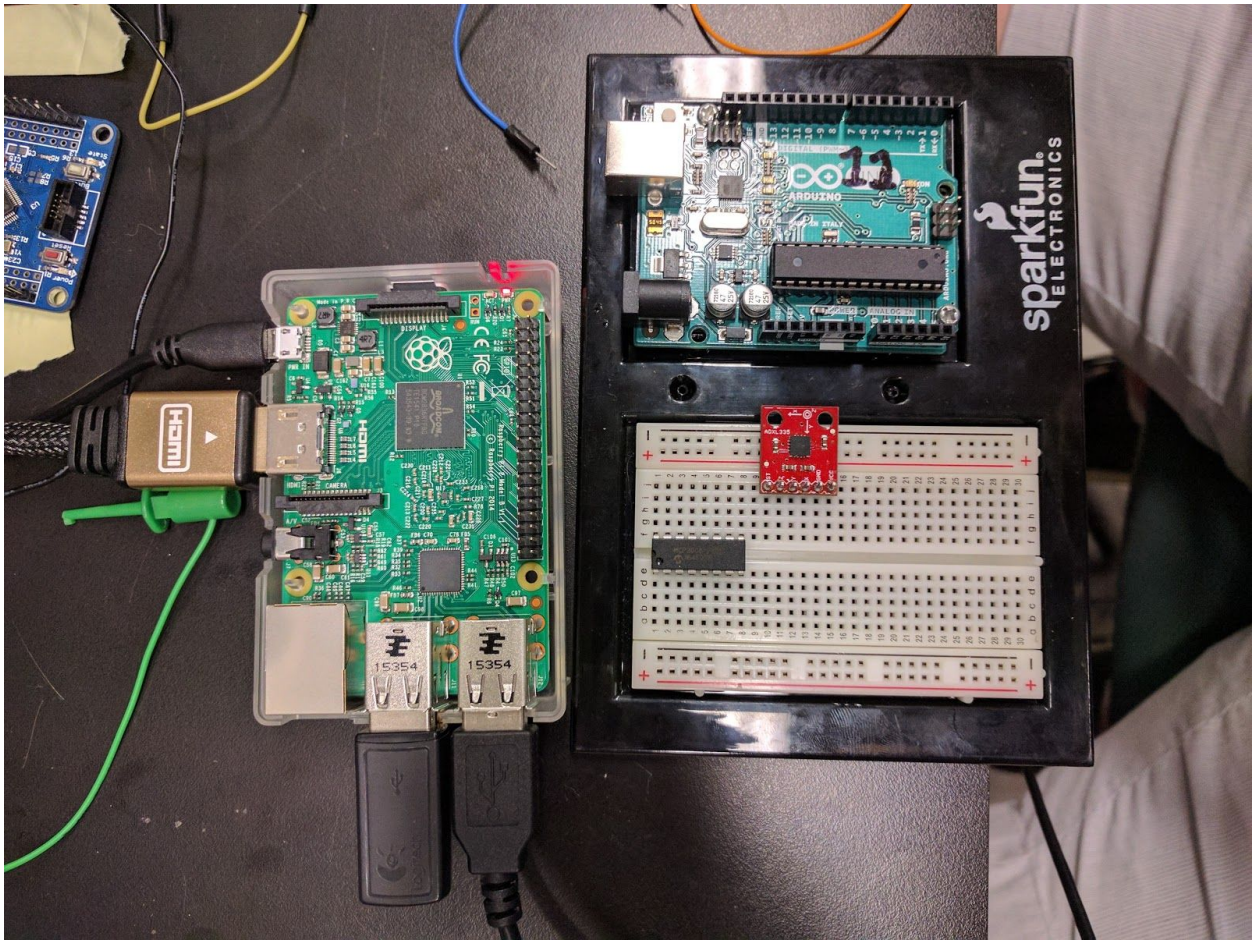
Hardware Setup

Materials

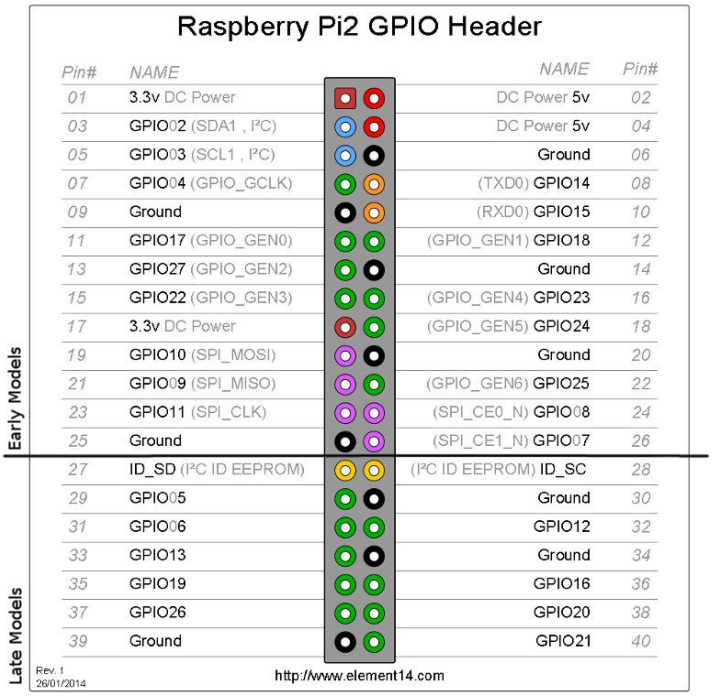
Name	Notes	Image
Raspberry Pi B+	Also requires power cable (micro USB) but I'm pretty sure you have to buy it along with the power cable.	
32 GB Micro SD Card	You can buy this pre-loaded with NOOBS, the operating system for the Pi, or you can load NOOBS yourself.	
WiFi Dongle	Edimax EW-7811Un	
ADC	MCP3008	

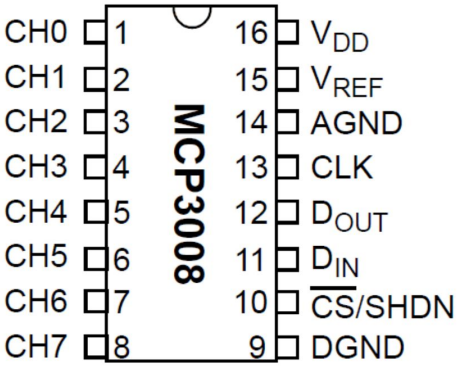
Accelerometer	SparkFun Triple Axis Accelerometer Breakout	
Breadboard		
Male to female x 6		
Male to male x 6		
Keyboard		
Mouse		
HDMI Cable		
HDMI-compatible monitor		

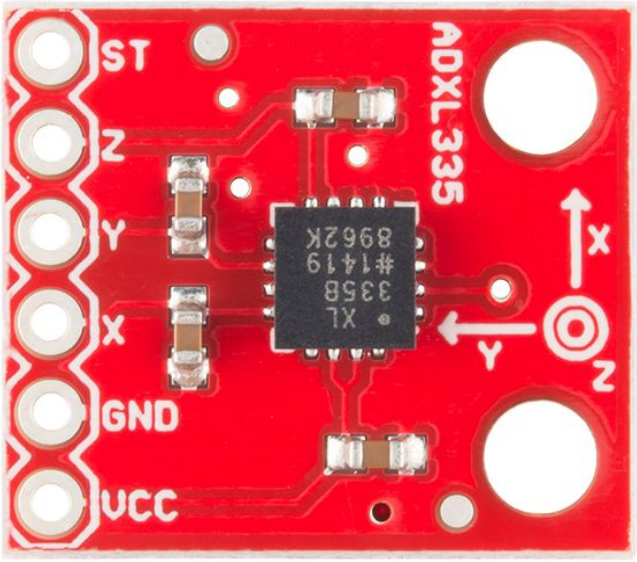


Connecting Up Accelerometer

Useful tutorial that does almost this:
https://cdn-learn.adafruit.com/downloads/pdf/reading-a-analog-in-and-controlling-audio-volume-with-the-raspberry-pi.pdf

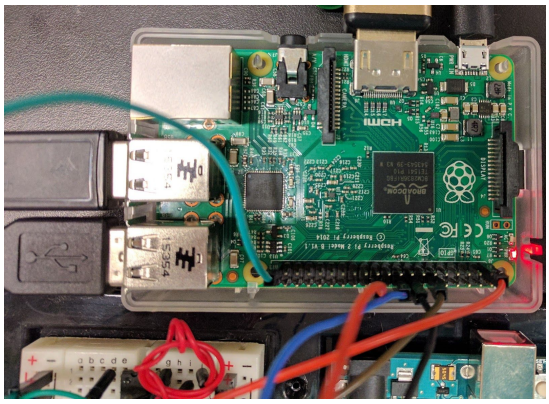

Raspberry Pi2 GPIO Header
Pin# NAME NAME Pin#
01 3.3v DC Power DC Power 5v 02
03 GPIO02 (SDA1 , I²C) DC Power 5v 04
05 GPIO03 (SCL1 , I²C) Ground 06
07 GPIO04 (GPIO_GCLK) (TXD0) GPIO14 08
09 Ground (RXD0) GPIO15 10
11 GPIO17 (GPIO_GEN0) (GPIO_GEN1) GPIO18 12
13 GPIO27 (GPIO_GEN2) Ground 14
15 GPIO22 (GPIO_GEN3) (GPIO_GEN4) GPIO23 16
17 3.3v DC Power (GPIO_GEN5) GPIO24 18
19 GPIO10 (SPI_MOSI) Ground 20
21 GPIO09 (SPI_MISO) (GPIO_GEN6) GPIO25 22
23 GPIO11 (SPI_CLK) (SPI_CE0_N) GPIO08 24
25 Ground (SPI_CE1_N) GPIO07 26
27 ID_SD (I²C ID EEPROM) (I²C ID EEPROM) ID_SC 28
29 GPIO05 Ground 30
31 GPIO06 GPIO12 32
33 GPIO13 Ground 34
35 GPIO19 GPIO16 36
37 GPIO26 GPIO20 38
39 Ground GPIO21 40
Early Models
Late Models
Rev. 1
26/01/2014
http://www.element14.com

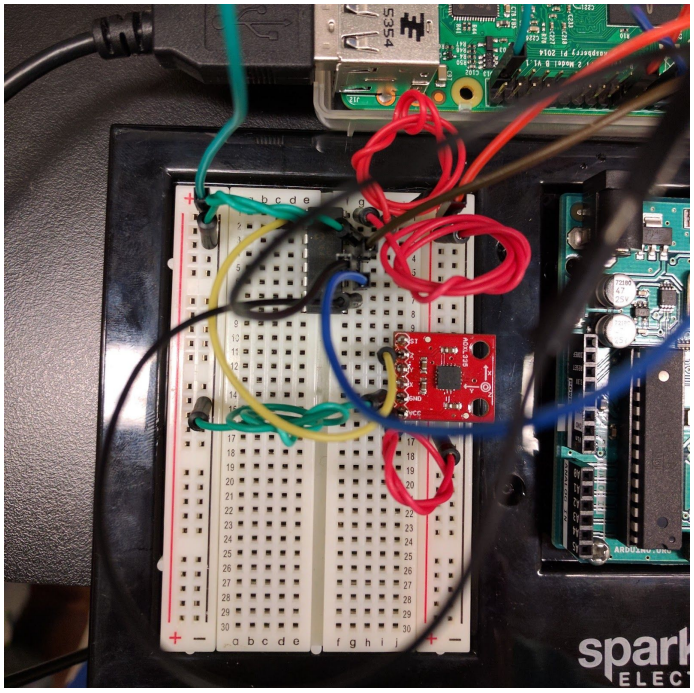

MCP3008
CH0 1
CH1 2
CH2 3
CH3 4
CH4 5
CH5 6
CH6 7
CH7 8
16 VDD
15 VREF
14 AGND
13 CLK
12 DOUT
11 DIN
10 CS/SHDN
9 DGND


ST
Z
Y
X
GND
VCC
ADXL335
X
Y
Z

Connections

From	To	With
RPi Power	Power breadboard (red rail)	Female to Male
RPi GND	GND breadboard (black rail)	Female to Male
Sensor GND	Black rail	Male to Male
ADC GND	Black rail	Male to Male
Sensor PWR	Red rail	Male to Male
ADC PWR	Red rail	Male to Male
ADC PWR	ADC Reference	Male to Male
RPi GPIO 18	ADC CLK	Female to Male
RPi GPIO 23	ADC D_out	Female to Male
RPi GPIO 24	ADC D_in	Female to Male
RPi GPIO 25	ADC CS/SHDN	Female to Male
Sensor Output (e.g. x, y, z)	ADC CH0	Male to Male

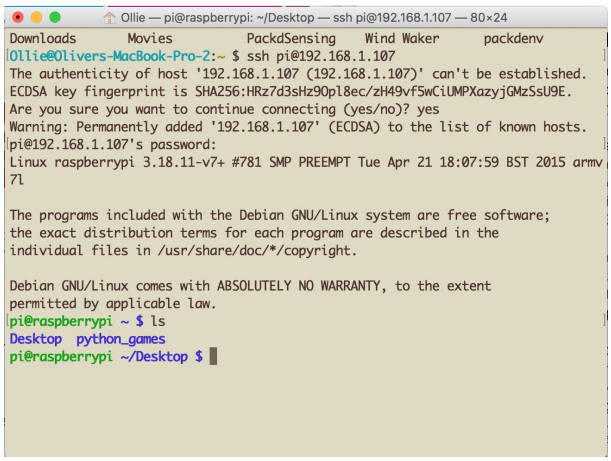


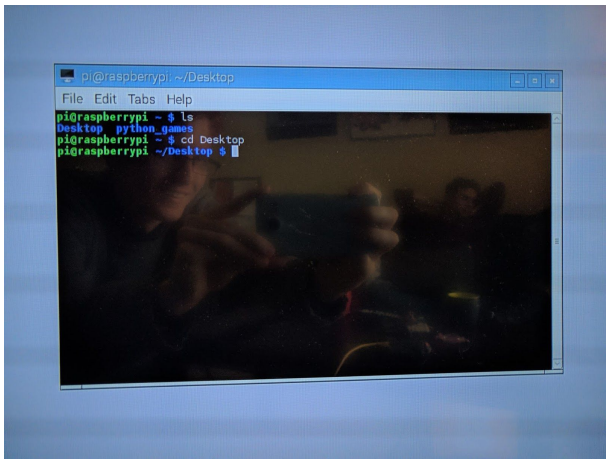


Software Setup

SSH (Secure Shell)

- The purpose is to be able to do actions on the Raspberry Pi without setting up the monitor, keyboard, or mouse.
    - http://www.instructables.com/id/Use-ssh-to-talk-with-your-Raspberry-Pi/





We connect through the internet between our personal computers and the Raspberry Pi.

1. Enable SSH on Raspberry Pi
    a. Go to terminal.
    b. Type in `sudo raspi-config`.
    c. On the terminal, then navigate to ssh (it's under "Advanced Options"), hit Enter and select Enable or disable ssh server.
    d. Reboot.
2. Get the IP Address of the Raspberry Pi
    a. Go to terminal again, and check the ip-address with the command `ifconfig`.
    b. Look for the line `inet addr:192.168.1.107` (or something like that). Use the one that corresponds to the internet connection that you set up (`eth0` if it's an ethernet cable, `wlan0` if it's a WiFi connection).
3. Connect to the Raspberry Pi from your personal computer.
    a. On Mac:
        i. Go to terminal
        ii. Run the command: `ssh pi@[ip_address]` (replace the ip address with whatever you got in the previous section).
        iii. It might ask "`The authenticity of host '192.168.1.107 (192.168.1.107)' can't be established. ECDSA key fingerprint is SHA256:HRz7d3sHz9Opl8ec/zH49vf5wCiUMPXazyjGMzSsU9E. Are you sure you want to continue connecting (yes/no)?`" This is just

double-checking whether an impostor is pretending to be our Raspberry Pi (which it probably isn't). Just say "`yes`"

iv. Password is `raspberry`

v. Now you can run commands as if you were in the terminal for the Pi.

b. On PC:

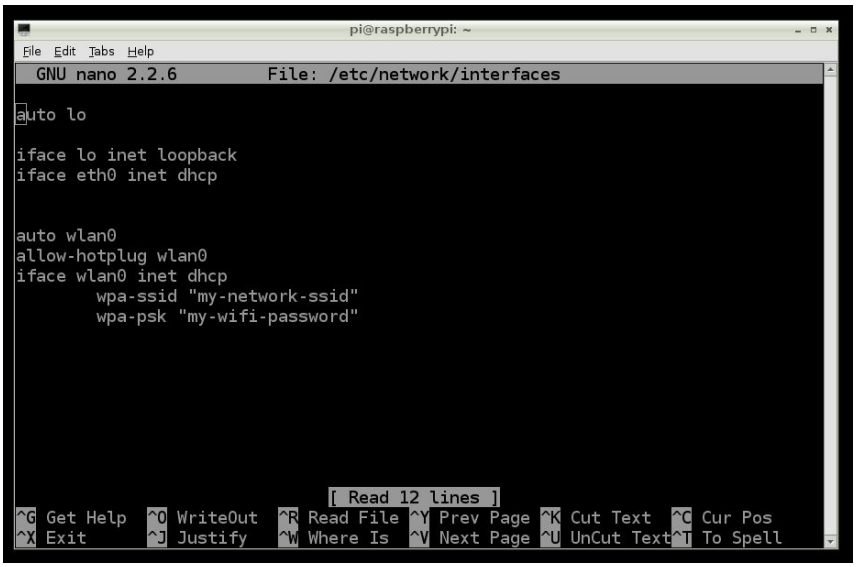
i. http://www.instructables.com/id/Use-ssh-to-talk-with-your-Raspberry-Pi/step2/Install-Putty-On-your-PC/

Connect to WiFi

https://learn.adafruit.com/adafruits-raspberry-pi-lesson-3-network-setup/setting-up-wifi-with-occidentalis

- Relevant Files:
  - `/etc/network/interfaces` = The file where the Raspberry Pi saves its WiFi settings.
- Relevant Commands:
  - `sudo nano /some_folder/my_file_name` = Opens a text editor inside the terminal called Nano.
    - Make changes as you would with any other editor.
    - To save, use `ctrl+x` (press ctrl and x at the same time).

1. Boot the Raspberry Pi without the WiFi adapter plugged in.
2. Open a terminal session.
3. Type `sudo nano /etc/network/interfaces`
4. Modify the file to look like:

a. 

5. Reboot
6. Check whether it connected with `ifconfig`

Record Data (Run the Code)

- Open terminal
- Navigate to `~/Desktop/peses/` by using the command
  - `cd ~/Desktop/peses/`
- Pull the newest version of the code using `git pull origin master`
  - Side note: You can use `ls` to see what files and folders are in the current directory.
- Run the code by using the command:
  - `python record_data.py`
  - You can also modify parameters by calling it like this:
    - `python record_data.py -b 20 -n 100 -t 5 -s 0.001 -f my_file_name -m 3`
  - Or like this:
    - `python record_data.py -before 20 -num 100 -tolerance 5 -sleeptime 0.001 -filename my_file_name -maxtime 3`
  - Note: you don't need to use all/any of the flags. They're just there if you want to change from the defaults.
  - Another note: If you ever forget you can call:
    - `python record_data.py --help`
    - It will display something like this:
    -

```
optional arguments:
  -h, --help            show this help message and exit
  -b BEFORE, --before BEFORE
                        Number of samples that will be saved from just before
                        we hit the threshold.
  -n NUM, --num NUM     Number of samples that will be saved.
  -t TOLERANCE, --tolerance TOLERANCE
                        The amount that the table needs to shake before
                        recording will start.
  -s SLEEPTIME, --sleeptime SLEEPTIME
                        How much to sleep in between measurements.
  -f FILENAME, --filename FILENAME
                        Filename to save to. Looks like
                        "saved_CSVs/<FILENAME>.csv"
  -m MAXTIME, --maxtime MAXTIME
                        Upper limit on the recording time. Starts *after* you
                        hit threshold.
```

Move Data from Raspberry Pi to your Personal Computer

- If you're using the graphical user interface:
  - Just email it lol
- If you're SSH'd in:
  - Use the `scp` command. (I might write a proper set of instructions later, but you can google it - it's pretty easy)
  - Use an ftp client.

- Push to the Github repository to download on your own computer.
  - Push the newest changes to the code to the Github repository using the following commands in order:
    - `cd ~/Desktop/peses/`
    - `git add -A`
    - `git commit -a -m "what I did was…"`
    - `git push origin master`
  - It works perfectly fine on my home Wifi but apparently other Wifi breaks it :(
  - Once you have pushed to Github, go to https://github.com/oliverodaa/peses to download the CSV you just made. It's a public repo so you shouldn't have to log in.
    - Note: Laura made the github username "PESES" https://github.com/peses so you can log in with that if you need to.

Modify the Code

The code lives at https://github.com/oliverodaa/peses

- On the Raspberry Pi:
  - Go into the terminal
  - Pull the newest version of the code using `git pull origin master`
  - Make your changes using your text editor of choice (perhaps `sudo nano <my_file>`?)
  - Push the newest changes to the code to the Github repository using the following commands in order:
    - `git commit -a -m "what I did was…"`
    - `git push origin master`
- On your personal computer (I'm assuming PC is similar to Mac):
  - Go into the terminal
  - Pull the newest version of the code using `git pull origin master`
  - Make your changes using your text editor of choice (I use Sublime Text)
  - Push the newest changes to the code to the Github repository using the following commands in order:
    - `git add -A`
    - `git commit -a -m "what I did was…"`
    - `git push origin master`